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ABSTRACT

Play behaviors of infants who had normal hearing or were deaf were observed during free play with their mothers, at ages 9, 12, and 18 months. Participants included 15 dyads of children who were deaf and mothers who were not, 15 dyads of children and mothers who were both deaf, and 15 dyads of children and mothers who both had normal hearing. Children with normal hearing displayed more representational play at 12 months than did either group of children with deafness. Equal amounts of symbolic play at 18 months were displayed by the dyads of children/mothers who were both deaf and children/mothers who both had normal hearing. Deaf children whose mothers could hear lagged behind the other two groups on production of higher-level play at 18 months. Individual differences in 18-month production of representational and symbolic play were largely explained by characteristics of mother's behaviors during earlier interactions with the child. Child level of expressive language was associated with the amount of higher level play demonstrated at 18 months. It is concluded that child play during interaction with mother reflects influences from both the social environment and from child cognitive-symbolic abilities. (Contains 96 references.) (SW)

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A Descriptive Study of Play by Deaf and Hearing Infants

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Abstract

Play behaviors of deaf and hearing infants were observed during free play with mothers at 9, 12, and 18 months. Subjects included 15 dyads of deaf children and hearing mothers, 15 dyads of hearing children and hearing mothers, and 15 dyads (with two alternate dyads at 12 months) of deaf children and Deaf mothers.

The three groups of children developed play behaviors in the general order posited in earlier work, but the rate at which those behaviors developed and were displayed differed according to the hearing status of child and mother. Production of manipulative and relational play was similar across the groups, but hearing children displayed more representational play at 12 months than did either group of deaf children. However, deaf children with Deaf mothers and hearing children with hearing mothers produced equal amounts of symbolic play at 18 months. Deaf children with hearing mothers continued to lag behind the other two groups on production of higher-level play at 18 months.

A significant portion of individual differences in 18-month production of representational and symbolic play was explained by characteristics of mother's behaviors during earlier interactions with the child. Child level of expressive language was concurrently associated with the amount of higher level play that was demonstrated at 18 months.

We conclude that child play demonstrated during interaction with mother reflects influences from the social environment as well as influences from child cognitive-symbolic abilities. Therefore, we believe that the mother-child dyadic play of children who experience either language delays or whose interactive experiences differ from those of normally-developing hearing children will differ from standards set through observation of the latter group of children.

Accordingly, observations and assessments of deaf children's play (in mother-child free play) during the ages of approximately one to one-and one-half years of age should not be used to predict future developmental trends or to infer cognitive or linguistic capacity or "readiness" based upon descriptions of development of hearing children. Further investigations of social, perceptual, and linguistic influences on the development of deaf children's play during the first two years of life are needed.

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Chapter I
The Development of Play Behaviors by Deaf and Hearing Children

Play as an Index of Development

Object play has its foundations during the first year of life when infants begin to contact, then to grasp and visually examine objects (Piaget, 1952). However, play is differentiated from instrumental behaviors with objects in that play is "...spontaneous activity, not directed at some externally imposed goal...[play] involves manipulation of or other actions directed at an object or set of objects, resulting in some transformation of their location, arrangement, shape...or of their meaning...." (Wohlwill, 1984: p. 144). Motivation for play appears to be intrinsic: play is engaged in for its own sake (Rubin, Fein, & Vandenburg, 1983).

Major steps in the development of play behaviors have been found to be strikingly similar in normally developing children and for children with cognitive delays (although relationships between age and play stages do not hold for the latter group) (Belsky & Most, 1981; Bretherton, 1984; Fenson, Kagan, Kearsley & Zelazo, 1976; Fenson & Ramsey, 1980; Lowe, 1975; McCall, 1974; McCune-Nicolich, 1981; Nicolich, 1977). The same general progression of play behaviors has been found across various cultures (Sigman, Neumann, Carter, Cattle, D'Souza & Bwibo, 1988; Sigman & Sena, 1993).

In general, play behaviors progress from simple manipulation of a single object to more complex manipulation, sometimes including multiple objects. Representational play in which replicas of objects are used as though they are the real object then emerges, followed by symbolic play, in which mental imagery or symbols become an integral part of the activity.[1] These developments occur during the first two years of life in most normally-developing children.

The progression toward symbolically more complex and abstract behaviors is representative of three developmental trends in cognitive processing. The first of these is "decentration." Decentration occurs as a child moves beyond her own prior experience with an object to imitate actions others have performed, to include a doll or another person as recipient of a play action, or (even later) to attribute feelings or agency to a toy. A second trend is that of "decontextualization." This can be seen in the child's use of progressively more abstract objects to substitute for real ones, beginning when she treats small replicas of objects as though they were real, and progressing to substitution of dissimilar objects, production of specific play behaviors without actually having the object in hand, and to participating in role play in which the child "substitutes" herself or another person for yet another identity. The third trend is toward "integration" as the child produces increasingly complex combinations of play behaviors. Manipulative play begins with a single object and progresses to include more than one object simultaneously. Then similar actions are

produced with different objects, different actions are combined, and finally ordered sequences, which appear to be precursors of "scripts" for replication of real life episodes, are produced (Bretherton, 1984; Nelson 1986).

These trends toward increasing flexibility of perspective-taking, decreasing linkage between symbols and context, and increasing ability to produce longer combinations of symbols are characteristic of cognitive development in general. Accordingly, a number of researchers have suggested that observations of play provide a measure of a child's cognitive development level (Belsky & Most, 1981; McCune-Nicolich & Fenson, 1984; Power & Radcliffe, 1989; Zelazo, 1980).

The same three trends are representative of increasing sophistication in language development. Piaget (1962) concluded that symbolic play and language are both overt representations of a unitary underlying "semiotic" or symbolic function, and more recently a number of researchers have documented normally-developing children's synchronous acquisition of analogous skills in play and language. For example, both Bates (1976) and McCune (McCune-Nicolich, 1982; McCune-Nicolich & Bruskin, 1982) reported that production of single words typically occurs soon after single representational acts are observed in a child's play. The same two researchers and their colleagues reported associations between production of word combinations and production of sequences of play behaviors (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Bates, Bretherton, & Synder, 1988; McCune-Nicolich & Bruskin, 1982; Shore, O'Connell, & Bates, 1984). The associations reported between levels of language and play have been documented so frequently, in fact, that some researchers have suggested that observations of child play can provide an assessment of the child's linguistic "readiness" or "capacity" (Lowe, 1975; McCune-Nicolich & Carroll, 1981).

Not all of the available evidence supports the existence of a consistent relationship between play and language skills. For example, McCune (McCune-Nicolich, 1982) noted that such a relationship does not exist when some kind of physical limitation prevents or interferes with linguistic production. More importantly, some researchers have failed to find the posited language-play relationship in studies with cognitively delayed children (Russell & Russnaik, 1981; Simon, 1986). In addition, studies of cognitively-normal hearing children with unexplained delays in language development have most often found those children to be delayed in their play behaviors when compared to linguistically-normal age mates but to be more advanced in play than younger children with whom they are matched by linguistic age (Brown, Redmond, Bass, Liebergatt & Swope, 1975; Lovell, Hoyle, & Siddell, 1968; Rescorla & Goosens, 1992; Roth & Clark, 1987; Skarakis-Doyle & Prutting, 1984; Terrell, Swartz, Prelock & Messick, 1984; Udwin & Yule, 1983). Recent reports have suggested that, just as the relationship between language and general cognitive abilities varies over time (Rice, 1983; Schlesinger, 1977), so the relationship between play and language changes as the child develops (Bloom, Liffer, & Broughton, 1985; Ogura, 1991; Terrell et al., 1984). Therefore, influences between play and language may wax and wane, with one ability influencing the other at one stage of development but with the direction of influence

reversing at other stages. For example, it seems that levels of cognitive development which are reflected in early representational play are necessary for a child's initial productive use of language. However, a case can be made that language begins to inform other aspects of behavior after its acquisition.

If language and play are mutually influential, questions are raised about the use of play assessments to estimate language potential or capacity. If language skill affects play production at some stages, it follows that observation of play behaviors during that developmental stage would give a negatively biased picture of the abilities of children whose language development is delayed. This would include deaf children with hearing parents, who frequently experience language delays of exogenous origin (Meadow, 1980; Moores, 1987; Rodda & Grove, 1987).

An additional factor, that of social support of play by the play partner, can also affect the outcome and interpretation of play assessments. There is growing evidence that maternal support increases the amount of higher level play displayed by children (Fiese, 1990; Slade, 1987; Turkheimer, Bakeman, & Adamson, 1989; but, see O'Connell & Bretherton, 1984 for a somewhat different interpretation). However, mothers of hearing children have been found to differ considerably in the degree to which they effectively support child play (Fiese, 1990; Vibbert & Bornstein, 1989). Cultural differences in degree of maternal support for symbolic play have also been reported (Tamis-LeMonda, Bornstein, Cyphers, Toda, & Ogino, 1992).

To the extent that maternal behaviors influence children's play, interpretation of play assessments for deaf children will be complicated. A long history of studies have shown disrupted, non-reciprocal interactions to be common between deaf children and their hearing parents (Cross, Johnson-Morris & Nienhuys, 1980; Cross, Nienhuys, 1985; Schlesinger & Meadow, 1972;Wedell-Monnig & Lumley, 1980; White & White, 1984). Given problems with reciprocal interaction, it may be more difficult for hearing mothers to provide effective support for their deaf children's play than is the case for hearing mothers with hearing children.

In addition, there has as yet been no analysis of behaviors which Deaf mothers use to support their deaf children's play[2]. Although many of the characteristics of interactions between Deaf mothers and their deaf children have been found to match those of hearing mother-hearing child dyads (Meadow, Greenberg, Erting & Carmichael, 1981), specific attentional and communication strategies have been found to differ between these groups of mothers (Spencer, Gutfreund, & Bodner-Johnson, 1992; Erting, Prezioso, & O'Grady-Hynes, 1990). Furthermore, Deaf adults form a separate sub-cultural group in the United States (Higgins, 1980; Padden & Humphries, 1988; Schein, 1968), and it should not be assumed that they will approach mother-child play with the same strategies and expectations as do hearing mothers from the majority culture. Therefore, we do not yet have evidence that deaf children either with hearing mothers or with Deaf mothers will experience the same kinds of maternal support for play that is typical of hearing-hearing dyads. More

information about influences on deaf children's play from mothers' interactive behaviors, as well as from child language ability, is necessary before assessments of play behaviors can be accepted as valid indications of the cognitive abilities or linguistic readiness of deaf children. As the following section will detail, the language factor has been addressed in some studies of deaf children's play, but effects of maternal behaviors have only rarely been considered.

Deaf Children's Play

Longitudinal data about the developmental course of play by deaf children are particularly scarce, and no available studies have included subjects younger than 15 months of age. Most studies have focused on children in the preschool to middle childhood age range and either include only deaf children with hearing parents or do not report parents' hearing status. Although previous studies have employed a variety of data collection and analysis methods, almost all have concluded that deaf children's play was deficient compared to the play of hearing children of the same age.

Some researchers have observed deficiencies in the social aspects of deaf childrens' play. For example, Higginbotham and Baker (1981), using a modification of Parten's (1932) social play categories as well as cognitive play categories developed by Smilansky (1968), compared peer play of 7 deaf children (ranging in age from 47 to 66 months) with that of a group of hearing children. Deaf children spent significantly less time in cooperative play and significantly more time in solitary play than the hearing children did. In addition, unlike the hearing children, the deaf children engaged in more constructional than dramatic play. The authors suggested that a history of communicative and interactive difficulties led the deaf children to actively avoid interactive play, preferring to play alone. Likewise, Mann (1985) reported that 5 deaf and 5 hearing children (36 to 72 months old) observed at school differed in social aspects of their play, with deaf children spending more time in solitary play.

In contrast, Gatty (1990) concluded from her detailed observations of the play of a pair of hearing boys and a pair of deaf boys (4-5 years old) that the dyads were similar in social aspects of their play but that cognitive aspects of the deaf children's play were deficient compared to that of the hearing children. Darbyshire (1977), like Singer and Lenahan (1976), also reported cognitive deficits in the peer-play of deaf children (ages 3 through 8 years). These deficits were shown by immaturity in their play and by use of less "make believe" and fewer object substitutions than expected for their age.

Research which has considered the factor of language level strongly suggests that deaf children's delayed or aberrant play behaviors result from language delay. For example, Casby and McCormack (1981) found a significant relationship between the expressive language skills of deaf children (38 to 69 months old) and cognitive aspects of their symbolic play, as measured by frequency of object substitution in a structured format. This was consistent with Vygotsky's report (1978) that deaf children's language abilities and production of object substitutions during play are related.

Following up on these reports, one of us analyzed play behaviors and expressive language productions of deaf and hearing two-year-olds interacting with their mothers (Spencer, Deyo, & Grindstaff, 1990, 1991; Spencer, 1992; Spencer & Deyo, 1993). To assure a range of linguistic and interactive functioning, two groups of deaf children (those with Deaf parents and those with hearing parents) were included. Representational and symbolic levels of play were coded. Child hearing status was not found to be significantly related to the level of play shown. However, level of expressive language development (based on child performance and mothers' reports) was significantly related to length and complexity of play sequences as well as to the amount of time in substitution or planned symbolic play. Children with higher expressive language levels (regardless of hearing status) spent more time in higher levels of play. In contrast, time spent in lower levels of play with representational objects was not significantly related to either language level or to hearing status.

In the only available longitudinal study of play of deaf toddlers, Gregory and Mogford (1983; Gregory, 1985) also found early levels of representational play (appropriate use of dolls, toy vehicles, toy eating utensils) to be intact, while higher symbolic levels of play were deficient. These researchers collected data from deaf children observed in their homes with their hearing mothers between the ages of 15 and 30 months. Comparison groups of hearing children were included at each data-collection age. Data were obtained through administration of a structured test of representational play (Lowe & Costello, 1976) as well as interviews in which mothers were quizzed about characteristics of their children's play. Sessions of child-mother play with toys were videotaped. Compared with hearing children of the same ages, deaf children were found to be less likely to engage in play involving coordination of more than one object, play involving imaginary objects, or play showing pre-planning of activities. The deaf children were more likely than hearing children to engage in "inappropriate" play with an object (apparent representational play but when one object has been mistaken for another one), to be distracted from their play, or to engage in context-bound play. It appears that the deaf children were able to play appropriately with toy objects which clearly represented real objects but that they were unable to step beyond the context to engage in symbolic manipulations.

Although Gregory and Mogford noted interactive differences between dyads with hearing compared to deaf children (i.e., increased intervention and directiveness from the mothers of their deaf children), they attributed the deficiencies in the deaf children's play primarily to their delayed language skills. The researchers posited that this deficit interfered with the children's ability both to plan play sequences and to learn how to play during their interactions with adults and with peers.

Gregory and Mogford also suggested that deaf children's pattern of play development may be affected by the fact that they "...structure their world in a way that differs fundamentally from the way in which hearing children do...." (p. 230). That is, deaf children's developmental patterns might be influenced in subtle ways by the fact that they depend more on visual information and less upon auditory information about activities in the

environment than hearing children do. Given a supportive interactive environment, greater dependence upon vision might result in increased visual awareness and attention to activities of others with objects--thus accelerating early representational play with objects. On the other hand, early development without access to audition might have a contrary effect, decreasing the total amount of information the child obtains from the environment and, therefore, her ability to learn from it.

Thus, despite hopeful suggestions that observation of play behaviors might provide useful information about deaf children's cognitive abilities and readiness for language, too many questions remain unanswered about factors influencing both hearing and deaf children's play development for such assessments to be used with confidence. The present study addressed some of those questions by documenting the play behaviors of hearing as well as deaf toddlers at ages when formal language typically emerges and a transition occurs from non-representational to representational and symbolic play. Deaf children with Deaf parents as well as those with hearing parents were included as subjects. The former group of children were expected to reflect any developmental differences in play that result from lack of auditory information even when the social environment is adapted for visual information processing and language development is occurring at normal rates.

The following questions were addressed:

1. Do deaf infants and toddlers develop and display play skills at the same rate and in similar form to that shown by hearing children? (That is, can existing descriptions of developmental steps in play behaviors of hearing infants be used for interpreting young deaf children's behaviors?)

2. To what degree are deaf infants' and toddlers' language and play development related?

3. What is the degree of association between the play of deaf infants and toddlers and characteristics of mother-infant interaction such as maternal responsivity, involvement, and positive affect?

Based upon existing literature, we hypothesized: (1) deaf and hearing children's play at 9 and 12 months would be similar but differences would be found in at least a subset of the deaf children by 18 months of age when language becomes a more important component of the interactive context; (2) the level of play at 18 months would be strongly associated with toddlers' use of formal language (whether manual or oral), with higher language levels associated with higher play levels regardless of child hearing status; (3) positive mother-infant interaction would be associated with higher levels of play regardless of child hearing status.

Chapter II
Methods

This report is based on data obtained from videotapes collected for previously completed research with hearing mothers and their deaf and hearing infants (MacTurk, Meadow-Orlans, Koester, & Spencer, 1993; Meadow-Orlans & Steinberg, 1993; Spencer, 1993a, b) and a study in progress with Deaf mothers and their deaf and hearing infants (Moores & Meadow-Orlans, 1991). The current analyses focus on child play behaviors and on associations between child play, child expressive language, and mother-child interaction during mother-infant free play. This activity was one component of a longer sequence of activities videotaped for the two longitudinal projects.

This chapter begins by describing characteristics of the subjects included in these current analyses. Descriptions of the free play activity and of procedures for characterizing play, interaction, and language behaviors are provided, with specific reference to systems for coding or rating behaviors and to methods used to assure reliability of the measures.

Subjects

This study analyzed the behaviors of 15 dyads seen at 9, 12, and 18 months in each of three groups: deaf children with Deaf mothers (Group DD), deaf children with hearing mothers (Group DH), hearing children with hearing mothers (Group HH). The population of deaf children with Deaf mothers is of particularly low incidence (Rawlings & Jensema, 1977) and was the group with fewest available subjects. Most group DD dyads were recruited in the Washington, D.C., area through announcements and personal contacts in the Deaf community. The Gallaudet research team included several members of the Deaf community who provided liaison with this group. The final sample included 13 dyads in Group DD for whom tapes were available at all three target ages. Two other dyads in this group contributed data at 9 and 18-months only. Two additional dyads who had been present for the 12-month taping session but had missed other sessions were included as alternate subjects for analyses of Group DD behaviors at 12 months. All DD dyads who had been videotaped for a 9-month session, had completed the 18 month session by the time the current analyses of play behaviors were performed, and met the criteria for subjects, are included in this report. Therefore, analyses of group DD specific to each age include 15 subjects; those comparing across ages include only 13 DD subjects.

Each of the other two groups, deaf children with hearing mothers and hearing children with hearing mothers, was comprised of 15 dyads with data for all three ages. Subjects who provided the best match for child's gender and mothers' educational level were selected from the available pool. Hearing dyads were recruited (with one exception) in the Washington, D.C., area via media announcements and personal contacts. Over a period of approximately three years, 24 HH families meeting the project's requirements participated in all three of the data collection sessions.

Significant efforts were required to recruit deaf children and hearing mothers. Members of the original research teams established contacts with local educational agencies as well as hospitals and clinics serving families with infants in five major U.S. cities, including Atlanta, Boston, Pittsburgh, Dallas, and Washington, D.C. Educational and medical/clinical personnel posted notices and informed families about the possibility of participating in the longitudinal research project. Parents who agreed were then contacted by the research staff. For dyads outside the Washington, D.C., area, tapes were made and data collected by research teams at participating universities in their local area[3]. Over a three year period, 20 DH families joined the research project and participated in all three of the videotaping sessions.

Table 2.1 provides summary information about the groups of subjects in the current study on variables which were quantifiable. The groups were similar on mothers' age and educational level. Mothers' ages ranged from mid-twenties to late-thirties. All but one mother had graduated from or attended college. With the exception of one Asian-American mother in group HH, all families were Caucasian American. Spoken English was the home language for families in groups HH and DH, with some of the parents in the latter group beginning to accompany their spoken language with signs. American Sign Language was the home language for the families in group DD.

Group differences in children's gestational age at birth approached significance ($F[2, 44] = 2.92$, $p = .06$). Two children in group DH were born prematurely, so scheduling of their taping sessions was corrected for gestational age.

The two groups with hearing loss had a similar mean degree of loss (in the severe range). Hearing losses of individual children in group DH ranged from moderate to profound; hearing losses in group DD ranged from mild to profound. All hearing losses were bilateral and sensorineural.

Families in group DD expected that their children might be deaf and the children's hearing losses were usually identified near the time of their birth. None of these children were using amplification during the time period in which data were collected. All of these children have hereditary deafness. By the time of the final taping session, all of the families were participating in early intervention programs. The programs used American Sign Language or English-based signing systems plus speech as the language of instruction.

Hearing losses of children in group DH were identified between birth and seven months of age (mean = 2.8 months). All of these children used amplification. Nine of the families were participating in early intervention programs employing English-based signing systems plus speech as the language method, and six families were participating in oral programs. The identified (or suspected) etiologies of the children's hearing losses included meningitis (1), maternal viral infections during pregnancy, including cytomegalovirus (CMV) (3), neonatal jaundice (1), Rh incompatibility (1), antibiotics given to mother during pregnancy (1), complications of prematurity (1), heredity/genetics (3), unknown (4).

Table 2.1

Selected Characteristics of Participating Dyads (By Group)

	n	Means				
		Infant Birth Order	Gestational Age (Weeks)[1]	Mother's Age (Years)	Mother's Education (Yrs)	Child's Hearing Level[2]
Hearing Children/Hearing Mothers	15	1.5	39.7	31.6	16.8	1
Deaf Children/Deaf Mothers	17	1.6	40.2	31.2	16.2	5.1
Deaf Children/Hearing Mothers	15	1.7	38.1	31.1	15.3	5.6

[1] F= 2.92, p= .06; DD>DH; Age at taping corrected for prematurity.
[2] From scale in which 1= no loss; 2= mild; 3= moderate; 4= moderate-severe; 5= severe; 6= severe-profound; 7= profound

Periodic assessments were conducted using the Physical and Self-Help subscales of the Developmental Profile II (Alpern, Boll, & Shearer, 1980) and a set of structured interviews (available in Meadow-Orlans, MacTurk, Spencer, & Koester, 1991) to assure that the three groups of children were free of suspected or identified developmental delays and that none were experiencing significant medical problems. Cognitive and motor development of all subjects were within normal limits.

Procedures for Data Collection

Mothers and infants came to the laboratory for data collection sessions within two weeks of the day the infant would reach the target age of 9, 12, or 18 months. Data collection included a number of different videotaped formats and, at specified times, interviews of the mothers and completion of a set of questionnaires by both parents. In addition, a parental interview was conducted in the families' homes when infants were 15 months old. (For some of the earliest participants, that interview was conducted at 12 months.) The complete procedures for data collection are described in Meadow-Orlans et al. (1991).

The data on which current analyses are based are obtained from a mother-infant play activity which occurred at each laboratory data collection session. This activity lasted for 15 minutes at the 9 and 12 month sessions and for 20 minutes at the 18 month session. It was the second activity at 9 months, the first activity at 12 months, and the final activity at 18 months. Before the period of mother-infant play began, a set of toys based on those used and recommended by McCune-Nicolich (1983) and Belsky and Most (1981) were placed on a quilt on the floor of the laboratory near the child. These toys were chosen to allow for representational and symbolic play as well as manipulative and relational play. (A list of the toys provided during the session is given in Table 2.2.) An investigator then sat in the room with mother and child, conversing with the mother while the child played alone with the toys for approximately five minutes. (In pilot work, we found that the transition into dyadic play was eased, and mothers' tendency to direct the play decreased, when children had already started playing alone.) The investigator told the mother that we were interested in observing the child's communication and play behavior in an unstructured situation, and that we hoped to see which toys the child preferred and how the child liked to play with them. After the child had explored the toys alone, the mother was asked to sit on the floor with her child and to "play with (your baby) just like you would when there is free time available at home--as naturally as possible."

The mother-infant play session was videotaped by two videocameras hidden behind one-way mirror/windows. Split-screen technology was used to record a picture of the dyad from two different angles and to assure that both mother and child were visible on the tape. Ten minutes from the sessions were utilized for the current analyses of play and language. The entire free play mother-child session was used for evaluating interaction.

Table 2.2 Toys Provided at Play Sessions	
- Shape and Stir Pot - Blocks with wagon - The Touch Me Book - Toolbox with tools - 2 saucers - 2 tea cups - Teapot - 3 bowls - 2 spoons - 2 baby bottles - Drinking glass	- Tongue depressor - Comb and brush - Hand mirror - Sunglasses - Sponge - 3 wheel vehicle with bear - Pop beads - Monkey - Adult male and female dolls - Baby doll with blanket - Telephone

Procedures for Coding Play Behaviors

The coding system was based heavily on that described by McCune (1983) and was further influenced by the work of Belsky & Most (1981). The system also reflects influences from Fenson and Ramsey (1980) and Bretherton (1984). The coding categories are listed in Table 2.3 below. More complete definitions and instructions for coding are given in Appendix A.

The system encompasses four major developmental levels of play, beginning with manipulation of objects, followed by relational play (in which more than one object is manipulated), representational play (in which toy objects are used in a fashion consistent with the function of the real object they represent), and symbolic play. Manipulative play includes mouthing, simple manipulation or visual exploration, differentiated manipulation, and complex manipulation. Relational play includes subcategories of non-functional related, functional related, and complex (or constructional) related play. The representational play category is differentiated to include single-act play directed toward self and other, and sequences of related representational activities. The category of symbolic play is comprised of representational activities which have a highly decontextualized element: that is, activities in which the child must perform mental transformations. The symbolic category, therefore, includes sequences in which the child must mentally supply a "correct order" of events, activities in which one object is substituted for a physically dissimilar one, and activities in which the child assumes or assigns "roles" or attributes feelings and/or behaviors to an inanimate object such as a doll or stuffed animal toy. Representational and symbolic codes also distinguished between acts directed toward the child herself and those which were decentered (directed toward and/or taking the perspective of another person or object such as a doll).

Table 2.3

Play Coding Categories

Manipulation of single objects

- Mouthing
- Simple Manipulation/Examining
- Differentiated Manipulation/Exploration
- Complex Manipulation -- actions appropriate for specific object; part-whole relationships

Relational Play with two or more objects

- Simple, non-functional relational
- Functional-relational based on visual or physical characteristics of objects
- Complex-relational/Constructional (building, making designs)

Representational Play showing knowledge of object identify/function

- Inaccurate Representations (Object is mistaken for another)
- Emerging Self-oriented Representation (Enactive naming, recognitory gestures and somewhat inaccurately produced actions typically performed in real life by child)
- Emerging Decentered Representation (Brief or inaccurately-performed actions directed toward other person or doll and/or typically performed by other person, not by child)

- Established Self-oriented Representation (Actions like in Emerging Self-oriented category but produced accurately and with evidence of pretend)
- Establish Decentered Representation (Actions like in Emerging Decentered category but produced accurately and with evidence of pretend.)

Sequenced Representational Play (combinations or sequences of thematically related Representational actions)

- Same action, different locations
- Same action, different participants
- Different self-oriented actions
- Different decentered actions
- Book handling actions

Symbolic Play (with evidence of mental transformations or symbolic activity)

- Ordered self-oriented sequences
- Ordered decentered sequences
- Nonverbally planned actions
- Verbally-announced planned actions
- Non-verbally announced object substitutions
- Verbally announced object substitutions
- Attributional play (attributing feelings, agency to inanimate object or assigning "role to self or other)

The levels of manipulative through representational play are mutually exclusive and form an exhaustive set with the addition of a category of "no object play" representing times in which child was unfocused or was engaged in motor or social acts. Sequenced play and symbolic-level play were comprised of overlapping sets of representational play acts. These codes were, therefore, not mutually exclusive.

Coders watched the tapes and recorded the onset time of each codeable behavior, assigning a numerical code representing the basic level of play (manipulative through representational). Following McCune (1983), coders identified episodes in which child activity was centered on a specific object or set of objects. An episode might include a single act or a series of acts. Both frequency of play behaviors (acts) and duration of time (in seconds) of episodes were recorded.

Modifying Slade's (1987) rules for timing of episodes, episodes began when the child picked up a toy and began a codeable behavior with it. If only manipulative play was occurring, the episode was noted to terminate when the child put down the object or diverted attention from it for 2 seconds.

Relational-level episodes often included a series of individual acts, for example, repeatedly dropping blocks into a bucket and then dumping them out. Once a relational episode was established, brief periods of time in manipulation or diverted attention were subsumed within the episode without the code being changed. The episode was noted to terminate when the activity changed or the object(s) was released and the child's attention was clearly directed toward another activity.

Episodes of representational-level play also often included several related acts in sequence. Each act was noted and coded for decentration, level of sequence represented, and level of symbolism displayed when appropriate. The entire episode was considered to continue until the child reverted to manipulative play, relational play, or "no play" for a period of at least 10 seconds or when the child clearly re-directed his attention and began a different activity. Acts judged to be pre-planned had onset time recorded when the planning (whether verbal or non-verbal) was evidenced.

If camera angle prevented clear observation of the child's activity for a period of 3 seconds or longer, that time was coded "obscured" and a matching amount of time was added to the originally planned ending time of the videotape segment to be coded. All children were coded for an even 10 minutes of time.

The tapes were coded by two individuals who were trained by the first author and achieved at least 85% agreement across all codes on a set of six practice tapes. Coders then worked independently. Over the course of time in which coding was done, the two coders were periodically assigned the same tape to be coded independently and their rate of agreement was calculated. This set of tapes (6 at each age level--with an equal number of tapes from each hearing status group) was used for further calculations of inter-rater agreement.

Cohen's Kappa was calculated for each tape on the mutually exclusive codes comprising the subcategories of manipulative, relational, and representational play on a second-by-second basis. A mean Kappa of .82 (range .73-.96) was obtained. Simple percent of agreement (second-by-second) on these same tapes ranged from 82-98% with a mean of 87%.

Simple percent of agreement on frequency of acts ranged from 75-86%, with a mean agreement of 84%. Disagreement on acts most frequently involved omission by one or the other coder of one or more acts during a relational-level sequence and disagreement on whether simple manipulative acts lasted long enough to be coded. Agreement on representational-level acts was quite high (over 90%). Disagreements often centered on deciding whether a child was "pretending" to drink from a toy baby bottle or cup or was merely mouthing it. This ambiguity was also reflected in the analyses of agreement on time in codes presented above.

Because agreement on time in codes was addressed in the initial analyses of manipulative, relational, and representational play levels, only agreement on frequency of acts was calculated for sequence and symbolic-level codes. Because only representational- and symbolic-level acts were coded for sequence, and because definitions of sequence types were highly specific, agreement on those codes was quite high (98%). Similarly, agreement on codes at the symbolic level was high (97%).

Tapes were coded in an order set up by the first author so that dyadic hearing status varied randomly through the list. Because some mothers and infants used sign language on the videotapes, it was not always possible for coders to be blind to dyadic hearing status. (Discussions after completion of coding indicated, however, that coders were often unaware of child hearing status and of child gender.) However, care was taken to assure that the coders were blind to the hypotheses of the study. They were also unaware of the dyads' interaction ratings or the ratings of child language.

Procedures for Rating Mother-Infant Interactions

The rating scale used to characterize aspects of mother-infant interaction was developed by Meadow-Orlans and Steinberg (1993). The system employs global ratings based on overall viewing of the interaction, with summary judgements made on dimensions relevant to the interaction of mother and child.

Methodologically, this approach has an intermediate position on the continuum of qualitative and quantitative research. It relies on clinical judgement rather than on counts of discrete behaviors. Bakeman and Brown (1980) supported the use of this kind of rating scale in their report of a study combining both micro and global (macro) coding techniques in research with infants. Their macro ratings were more predictive of infants' later performance than were microanalytic measures, which led them to conclude that "...it may be more fruitful to think of characteristics of early interaction, like responsiveness, not as frequencies or sequences of particular acts but rather as a disposition which permeates all

of the mother's and/or all of the baby's interactive behavior. And in that case, global rating scales, and not sequential recording of minute particular behaviors followed by various microanalyses, might be the method of choice" (p. 445).

The mother-infant interaction rating scale used in this study was developed from several systems used with deaf children and their mothers in the past. A primary source was the scale developed by Schlesinger and Meadow (1972), used with deaf toddlers and hearing mothers. Another source was the scale used by Lederberg and Mobley (1990) with deaf infants, which was a modification of the Schlesinger/Meadow instrument, a scale developed by Crawley and Spiker (1983), and another used by Greenburg and Crnic (1988) in their study of mothers with premature and fullterm infants. Full definitions of scale dimensions are provided in Appendix B.

Based on the first five minutes of videotaped free play interaction, mothers are rated for their "provision of visual cues" to the infant, and for the quality of their affect (positive or negative) as reflected in facial expression. (To minimize the influence of vocal quality on these ratings, this portion of the tape is viewed without sound.) On the basis of the entire time in the free play situation (15 minutes at 12 months and 20 minutes at 18 months), mothers are rated for Use of Touch, Sensitivity (responsivity), Involvement, Flexibility, Overall Affect, and Consistency. Infants are rated for their Responsiveness to Visual Cues based on the first five minutes of videotape, and for Compliance, Affect, Involvement and Gentleness based on the entire time available. Dyadic ratings are given for dimensions of Mutual Enjoyment, Understanding and Turntaking.

Ratings are placed on a five-point continuum independently by each of two viewers. Differences of more than one-point are resolved by discussion and, when necessary, a re-playing of all or part of the tape. Summary scores for mother, child, and dyad are created by summing relevant components from both raters and dividing to achieve a mean. Aggregated mean scores for all relevant items are computed as a Global Summary.

Meadow-Orlans and Steinberg reported data on forty dyads comprised of hearing mothers and 18-month-old infants (20 were deaf or hard-of-hearing, 20 had normal hearing). Inter-rater reliability was evaluated by computing correlations (Pearson r) between the two rater's scores, which ranged from .89 to .98. T-tests for differences between the two were not significant on 14 of the 16 scale dimensions. Exceptions were infant's Attention to Visual Cues and mother's Use of Touch. These dimensions were eliminated from the summary rating scores. Cronbach's alpha for mothers' Summary Score was .95; for infant's Summary Score, alpha was .91; for dyadic Summary Score, alpha was .95; for Global Summary Score, alpha was .96.

Meadow-Orlans and Steinberg coded an additional 26 dyads for this study (10 with 18-month-old infants, 16 with 12-month-old infants). Two other raters were trained by Meadow-Orlans and worked individually with her to code the remainder of the tapes. One coded 18 dyads; the other coded 16 dyads.[4] For these data reduction operations, Cronbach

alpha values for the 18-month summary scores were: Mother .95; Child .89; Dyad .95; Global .96. For 12-month ratings, Cronbach alpha values were: Mother .94; Child .90; Dyad .94; Global .95.

Procedures for Coding Child Language Production

Expressive language productions of HH and DH children had previously been transcribed. Procedures used for those groups, including coding of a number of prelinguistic characteristics which are not addressed in the current analysis, are described in Spencer (1993a). Children's utterances which included at least one formal word or sign provide the basis for the current analysis of expressive formal language. Similarly, signed "utterances" of children acquiring American Sign Language (ASL) as their first language which contained at least one intelligible formal sign were transcribed from the tapes of the deaf children with Deaf parents who participated in this study.

Given the immaturity of the children's productions, a spoken word was considered to be "intelligible" if it contained approximations of at least two of the phonemes in the assumed word and if context supported interpretation. Examples include "gog" ("dog") and "bah" (bottle). Signs were considered to be "intelligible" if they included at least two of the significant features of the assumed sign and if context supported interpretation. Significant features include handshape, location in which sign is made, and movement of the sign (Stokoe, Casterline, & Croneberg, 1965; Wilbur, 1979). Examples include "Daddy" signed by moving the index finger (instead of a 5-hand) up to touch the forehead and "telephone" signed by moving an S-fist handshape (instead of a Y-handshape) to the ear.

Index-finger points to objects and persons were considered to be signs in the following situations only: (1) one or more points were produced in contiguity with a formal sign, filling the role of a demonstrative ("That/this [is] dolly"), a locational preposition ("Sit there"), or a personal pronoun ("You sit"). Points used in these ways were considered to be signs and their co-occurrence with another sign was considered to represent a multi-word utterance. A point made in isolation was considered to be a sign only if produced as a pronoun in direct response to a mother's question (Example: Mother asks, "Who is going to eat this?" Child responds, "Me.")

Tapes of DD dyads were reviewed by Deaf, native signers and were transcribed using modifications of conventions recommended by Johnson & Rash (1990), in turn based on recommendations by Liddell (1984). Transcriptions included onset time of the utterance, ASL form of the utterance, and its English translation. The work of one transcriber was reviewed by a second fluent Deaf signer, then by a hearing teacher of deaf infants and, finally, the first author, a hearing person familiar with the signing of young children. Disagreements on the ASL or English versions of the utterances were resolved by consensus, occasionally with the assistance of one or more fluent signers knowledgeable about the signing of young deaf children. Like the records made earlier of the language of HH and DH dyads, the resulting DD transcripts provided information about the frequency, length (number of signs/words), and content of utterances from each child.

Chapter III
Results

Group and Age Differences in Play Behaviors

Occurrence of Categories at 9, 12, 18 months

The relative frequency of various types and levels of play varied considerably from 9 to 18-months. Patterns were first examined by noting the number of children in each group who produced each category of play at each age. These results are shown in Table 3.1. Although disclosure of detailed developmental trends is limited by the relatively long periods of time between observations, some interesting patterns are apparent.

All children displayed simple and differentiated manipulation of objects at all three sessions, with most also mouthing objects. Fewer than half of the children demonstrated complex manipulations prior to 12 months, although more than half in each group demonstrated both simple and functional relational play from 9 months on. However, complex (constructional) relational play presented quite differently: It was not observed until the 18 month session when symbolic play had become frequent. Even then, complex relational play was produced by the deaf children only.

The simplest categories of representational play (inaccurate representations and emerging self-oriented and decentered) were observed as early as 9 months. Deaf children were as likely as hearing children to show early representations.

The category of inaccurate representations deserves further scrutiny. Inaccurate representations increased with age and, at 12 and 18 months, were displayed by more children in groups HH and DD than group DH. This pattern suggests that inaccurate representations reflect the same development as other representational play and, despite confusion of physical attributes of one object with another, can be considered along with accurately-identified representations when play is being assessed.

Truly established representational play (performed accurately and with clear evidence of pretending) did not appear until 12 months. Several patterns of interest occurred. First, the number of children in each group demonstrating this level of play increased by 18 months. Second, although nominally more children displayed self-oriented compared to decentered established play at 12 months, the difference was not strong. Furthermore, emerging representations at 9 and 12 months showed no consistent pattern favoring self-oriented over decentered representations. Finally, more hearing children than deaf children in either group displayed emerging and established representation categories of play at 12 months. This trend is especially noticeable for the established representation categories. By 18 months the pattern had changed, with the only evident difference seen in fewer DH children producing established decentered play compared to both other groups.

Table 3.1
Number of Children at Each Age in Each Group Performing Each Category of Play

	9 Months			12 Months			18 Months		
	DD[1]	DH	HH	DD	DH	HH	DD	DH	HH
Mouthing[2]	13	15	15	9	15	12	15	15	15
Manipulation, Simple/Differentiated	15	15	15	15	15	15			
Manipulation, Complex	2	3	6	7	8	12	14	9	5
Relational, Simple	11	12	14	10	10	12	8	12	10
Relational, Functional	10	11	8	14	12	15	12	14	13
Relational, Complex (Construction)	0	0	0	0	0	0	7	3	0
Representational, Inaccurate	0	2	1	5	0	3	6	4	6
Representational, Self (Emerging)	2	5	1	11	5	14	14	14	13
Representational, Decentered (Emerging)	5	1	2	6	8	9	9	9	13
Representational, Self (Established)				4	2	11	14	13	12
Representational Decentered (Established)				3	1	9	14	4	15
Sequence, Same Activity				1	0	1	5	2	3
Sequence, Varied Participant				5	3	7	7	8	10
Sequence, Varied Actions (Self Oriented)				0	1	2	6	7	5
Sequence, Varied Actions (Decentered)				1	0	9	13	12	14
Sequence, Book[3]						0	8	6	6
Symbolic Ordered (Self Oriented Sequence)						0	3	6	7
Symbolic Ordered (Decentered Sequence)						1	3	5	8
Symbolic, Nonverbal Planned							13	6	13
Symbolic, Verbal Planned							11	2	8
Symbolic, Nonverbal Substitution							4	3	4
Symbolic, Verbal Substitution							1	0	1
Symbolic, Attributional							2	0	5

[1] DD = Deaf child/Deaf parent
DH = Deaf child/ Hearing parent
HH = Hearing child/Hearing parent
[2] Mouthing and simple/differentiated manipulation combined at 18 months
[3] Book not available until 18 months

Sequenced representational play appeared at 12 months. Contrary to expectations, children were not as likely to produce sequences of the same activity, same participant, as sequences with more than one participant. (And, a close inspection of the data reveals that early varied participant sequences were more likely to involve a doll or stuffed object than mother.) As with all representational play, more hearing children than deaf in either group produced sequences of representational play at 12 months. This difference disappeared by 18 months, when most children in all three groups produced decentered sequences with varied actions, the most complex type of sequence. (Sequences of book-related pre-literacy behaviors were shown by about half of the children in each group; books were not provided at 9 and 12 months.)

Symbolic-level play did not appear (with one exception) until 18 months. At 18 months, ordered sequences, non-verbal and verbally planned play were observed in all groups. As with representational play, no pattern of precedence or preference was seen for self-oriented versus decentered behaviors in early ordered sequences. (Even the one child producing ordered sequences at 12 months produced decentered ones.) The longest sequence consisted of 3 discrete behaviors; almost all were simple 2-behavior sequences of "stir in bowl-feed self or other with spoon" or "pour in cup or bottle - drink or feed to self or other." Fewer than half of the children in any group demonstrated substitutions (verbal or non-verbal) or attributional play. Verbally-announced substitutions were demonstrated by only 2 of the 45 children. Fewer group DH children than HH or DD displayed verbally or nonverbally planned play, verbal or nonverbal substitutions, or attributional play.

Group Differences in Duration of Types of Play at Three Ages

Information given above about the number of children in each group who produced each level of play at each age suggests that, regardless of group, the children achieved levels of play in generally the same order. However, group differences in the rate of acquisition of some kinds of play were also suggested. These suggestions were investigated further by analyses of the mean duration of time spent in different play categories by the three groups.

Because of relatively small amounts of time in some of the coding categories, time in discrete categories was combined to produce three composite play measures: manipulative play, relational play, representational play. These categories are mutually exclusive. The manipulative play measure included the categories of mouthing, simple and complex manipulation. The relational play measure included simple, functional, and complex relational play. The representational play measure included time in all representational and symbolic level behaviors.

Polynomial contrasts were computed to identify trends in mean duration of time in each composite play measure over the 3 ages. With all three groups combined, manipulative play declined linearly over time ($t=-6.64$, $p<.0001$). This finding concurs with Belsky & Most's (1981) report. Both linear ($t=4.46$, $p<.0001$) and quadratic ($t=-4.20$; $p<.0001$) trends were significant for the relational play measure. Time in this composite category increased

greatly between 9 and 12 months, then dropped (but remained above original levels) at 18 months. Representational level play showed both linear ($t = 16.82$, $p < .0001$) and quadratic ($t = 8.93$, $p < .0001$) components, increasing slowly from 9 to 12 months, then showing a strong increase by 18 months.

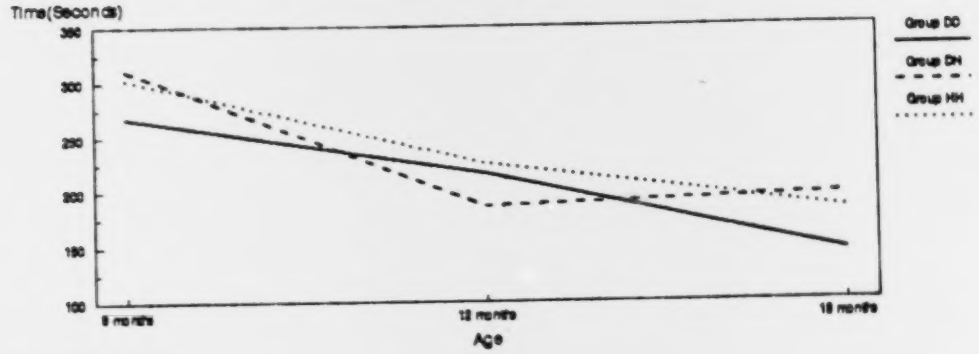
Figures 1 through 3 compare the trends on each composite measure for the 3 groups separately. As these figures illustrate, group DH had less time in each measure at 12 months than the other 2 groups did, thus group DH's total time playing with objects was less at that age. This explains, in part, the differing trends for group DH. Group DH showed a significant quadratic component in manipulative play and only a linear component for relational play. In the relational play measure, group DD also showed a pattern which differed in strength from that of the combined groups. Compared to the other groups, group DD's relational play increased the most from 9 to 12 months and decreased the most from 12 to 18 months, reflected in a significant quadratic component. Thus, although the general direction of time in categories of play over time is similar across groups, the relative rate of change over time differed between the groups.

Analysis proceeded with direct comparisons of group mean duration of time in each composite measure. Examination of distributions of the composite variables showed that durations of time in manipulative play, relational play, and total representational play were not significantly intercorrelated. To identify effects of hearing status group and child age on these measures, a series of three analyses of variance was conducted, with each composite play measure serving as dependent variable in one ANOVA. Hearing status group was the between-subjects factor and age was a within-subjects (repeated measure) factor.

Time in the two subcategories of representational play, sequenced representational play and symbolic play, were considered separately. Two additional analyses were conducted with these two variables. The ANOVA for Sequenced play employed hearing status group as a between-subjects factor and child age at observation as a within-subjects repeated measure. Symbolic play did not occur until 18 months and was, therefore, tested for hearing status group effects only.

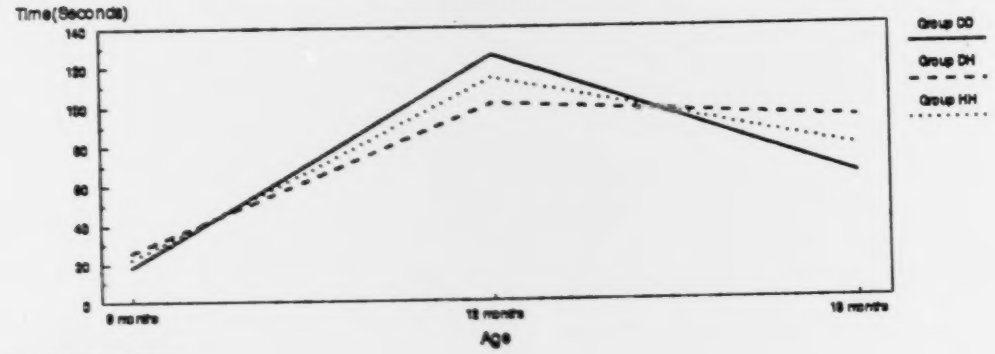
Using a Bonferroni-type correction for multiple tests, acceptable probability levels were set at .01 for main effects and interactions on this series of analyses. Square root or logarithmic transformations were applied to the variables when appropriate to improve distributional characteristics.

Fig. 1 **Group Patterns: Time in Manipulative Play**
9, 12, 18 months (Ten Minute Samples)
Groups DD, DH, HH



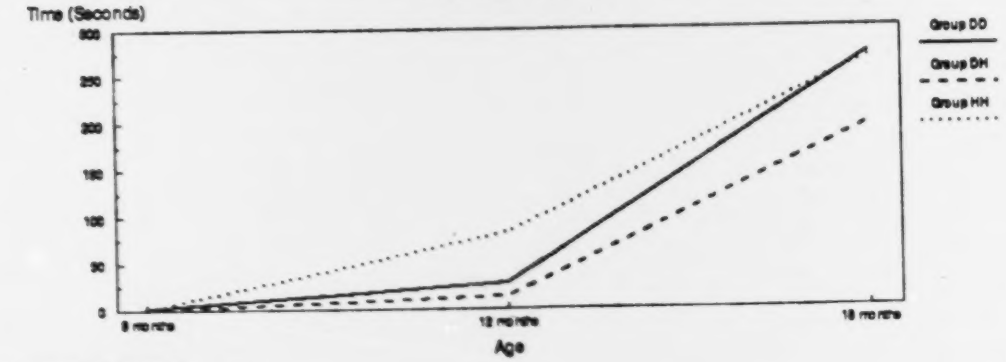
DD = Deaf children, Deaf parents
DH = Deaf children, Hearing parents
HH = Hearing children, Hearing parents

Fig. 2 **Group Patterns: Time in Relational Play**
9, 12, 18 months (Ten Minute Samples)
Groups DD, DH, HH



DD = Deaf children, Deaf parents
DH = Deaf children, Hearing parents
HH = Hearing children, Hearing parents

Fig. 3 **Group Patterns: Time in Representational Play**
9, 12, 18 months (Ten Minute Samples)
Groups DD, DH, HH



DD = Deaf children, Deaf parents
DH = Deaf children, Hearing parents
HH = Hearing children, Hearing parents

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Group means (and standard deviations) for untransformed variables can be seen in Table 3.2. Time in manipulative play and in relational play did not differ significantly by group, although both categories showed significant age effects [manipulation $F(2,39)=174.11$, $p<.0001$; relational $F(2,39)=24.20$, $p<.0001$]. (Tests were conducted using square root transformations of the relational play variable at each age and of the manipulation variable at 18 months.)

Time in representational play (employing square root transformations at 9 and 18 months and logarithmic transformation at 12 months) was found to differ significantly by group, $F(2,40)=4.77$, $p=.01$, and by age, $F(2,39)=501.76$, $p<.0001$. Interpretation is complicated, however, by the presence of a significant group by age interaction, $F(4,78)=4.14$, $p=.004$. Duncan multiple-range tests showed differences at or below the .05 level at 12 months, with group HH spending more time in representational play than groups DD or DH. By 18 months, however, groups HH and DD children had similar mean amounts of time in representational play, and the difference between their times and that of group DH failed to meet the adjusted criterion for statistical significance.

A final group comparison was made with the three major composite categories combined to create a new variable: total time in play. Group differences were of interest on this measure because of Mann's (1985) report that deaf children played for less of the available time than hearing children did. A significant group effect was identified, $F(2,40)4.82$, $p=.01$., as well as a significant age effect on the amount of time in play $F(2,39)=60.37$, $p<.0001$. Multiple comparisons showed that groups DD and HH played longer than did group DH children at 12 months. Differences at 18 months were not significant.

Mean time (and standard deviations) for the untransformed Sequenced play variable at 12 and 18 months is given in Table 3.3. Much of the representational play observed was also part of a sequence, therefore, analysis of time in sequenced play (with square root transformations performed) produced results similar to those for total time in representational play. ANOVA indicated a significant group difference, $F(2,40)=6.36$, $p=.004$, as well as a significant age difference, $F(2,40)296.57$, $p<.0001$. Follow-up tests showed that, at 12 months, hearing children's time in sequenced play exceeded both groups of deaf children. The difference at 18 months was not significant.

Symbolic play was observed to occur at the 18-month session only. A one-way analysis of variance indicated a significant group difference, $F(2,42)9.06$, $p=.0005$, with groups HH and DD higher than group DH. Group means and standard deviations are given in Table 3.3.

Table 3.2

Time (Seconds) in Composite Play Categories during Ten Minutes of Mother-Child Play: Three Groups of Children at Three Ages (Means and Standard Deviations)

Category	9 months			12 months			18 months			Effects		
	D/D	D/H	H/H	D/D	D/H	H/H	D/D	D/H	H/H	Group	Age	Group x Age
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)			
Manipulation										ns	p<.0001	ns
	267.2 (115.2)	310.8 (117.4)	302.5 (79.0)	217.1 (105.9)	187.2 (82.8)	225.9 (107.0)	145.0 (72.4)	196.9 (68.9)	183.7 (86.7)			
Relational										ns	p<.0001	ns
	18.7 (19.1)	26.0 (38.4)	22.4 (15.3)	126.1 (88.9)	101.8 (118.1)	114.4 (89.6)	64.5 (74.5)	93.3 (87.4)	78.9 (72.1)			
Representational[1]										p=.01	p<.0001	p=.004
	1.2 (2.9)	.7 (1.6)	.5 (1.1)	28.8 (34.5)	13.3 (17.7)	82.6 (70.5)	273.3 (112.1)	196.1 (79.2)	267.4 (80.4)			
Total Play[2]										p=.01	p<.0001	ns
	287.1 (121.9)	337.5 (115.3)	325.4 (88.6)	372.0 (78.9)	302.3 (103.3)	422.9 (85.2)	482.8 (56.2)	486.2 (58.9)	530.0 (63.7)			

[1] 12 months, HH>DD, DH
[2] 12 months, HH, DD>DH

Table 3.3

Time (Seconds) in Subcategories of Representational Play During Ten Minutes of Mother-Child Play: Three Groups of Children (Means and Standard Deviations)

Subcategory	12 months			18 months			Effects	
	D/D M (SD)	D/H M (SD)	H/H M (SD)	D/D M (SD)	D/H M (SD)	H/H M (SD)	Group	Age
Sequenced Play[1]							p=.004	p<.0001
	12.3 (19.5)	6.5 (14.2)	48.8 (51.8)	229.8 (116.7)	154.9 (79.2)	225.7 (100.5)		
Symbolic Play[2]							p=.0005	
				67.7 (48.8)	32.5 (35.7)	97.7 (70.5)		

[1] 12 months, HH>DD, DH

[2] 18 months, HH, DD>DH

Global Ratings of Interactions

Preliminary examination of the data showed that measures within each of the dimensions (mothers' behaviors, children's behaviors, dyadic behaviors) are strongly inter-correlated. Pearson Product Moment correlations for the five sub-scores for mothers' behaviors (sensitivity, involvement, flexibility, overall affect, consistency) correlated significantly ($p \leq .001$, one-tailed) with each other. (Twelve-month correlations ranged from .46 to .89; 18 month correlations ranged from .69 to .89). The same is true of the measures which make up the child summary score ($r = .65$-$.80$ at 12 months; $r = .53$-$.77$ at 18 months; all correlations $p \leq .001$, one-tailed) and of those which make up the dyadic summary score ($r = .78$-$.91$ at 12 months; $r = .81$-$.90$ at 18 months, all correlations $p \leq .001$, one-tailed). Summary scores for the three dimensions are also significantly correlated with each other.

Due to the significant associations between the interaction variables, group differences were initially investigated through multivariate analyses of variance, one for each set of subscale variables and a fourth including the three dimension summary scores as dependent variables. In each case, hearing status group (DD, DH, HH) was the between-group factor and age (12 months, 18 months) was a within-subject (repeated measure) factor. Analyses considered effects of group, age, and interactions involving those factors.

Analysis of the set of subscale rating categories comprising the Mothers' Behavior dimension indicated significant effects for group, $F(2,40) = 5.19$, $p = .01$, and an interaction between age and rating category, $F(4,37) = 6.26$, $p = .001$. Table 3.4 gives means and standard deviations for each maternal rating category at each age, plus results of follow-up tests. Follow-up analyses considered each rating category separately (with hearing status group as between-subject factor and age as within-subject, repeated measure) and revealed significant differences on mothers' Sensitivity, Flexibility, Affect, and Consistency. Age had a significant effect on scores for Sensitivity and Consistency only, with both being higher at 18 months. Duncan's multiple range tests indicated that each group difference was attributable to lower scores for group DH compared to either those for group HH (Sensitivity at 12 months, Flexibility at 18 months, Affect at 18 months, Consistency at 18 months) or to both groups HH and DD (Sensitivity at 18 months, Flexibility at 12 months, Affect at 12 months, Affect at 12 months, Consistency at 12 months). Groups HH and DD did not differ significantly on any measure.

Table 3.4

Group Means and Standard Deviations on Ratings of Mothers' Behaviors

Variable	12 months			18 months			Effects	
	D/D	D/H	H/H	D/D	D/H	H/H	Group	Age
	M	M	M	M	M	M		
	(SD)	(SD)	(SD)	(SD)	(SD)	(SD)		
Sensitivity[1]	3.7	2.7	4.1	4.0	3.3	4.4	F= 5.42	F= 5.88
	(1.2)	(1.3)	(1.0)	(1.0)	(1.5)	(.9)	p= .008	p= .02
Involvement	4.3	3.6	4.2	4.1	3.6	4.2	ns	ns
	(1.0)	(1.0)	(1.3)	(1.0)	(1.3)	(1.3)		
Flexibility[2]	3.6	2.6	4.1	3.5	2.9	4.0	F= 5.08	ns
	(1.3)	(1.0)	(1.2)	(1.2)	(1.5)	(1.0)	p= .011	
Affect[3]	4.0	3.0	4.1	3.8	3.1	4.1	F= 4.13	ns
	(.9)	(1.1)	(1.2)	(1.0)	(1.5)	(1.1)	p= .023	
Consistency[4]	3.9	2.6	4.1	4.1	3.7	4.6	F= 6.89	F= 20.76
	(1.1)	(1.2)	(1.2)	(.7)	(1.1)	(.6)	p= .003	p= .000
Summary Score[5]	3.9	2.9	4.1	3.9	3.3	4.3	F= 5.19	ns
	(1.0)	(.9)	(1.0)	(.9)	(1.3)	(.9)	p= .01	

[1] 12 months, DH<HH; 18 months, DH<DD, HH
[2] 12 months, DH<DD, HH; 18 months, DH<HH
[3] 12 months, DH<DD, HH; 18 months, DH<HH
[4] 12 months, DH<DD, HH; 18 months, DH<HH
[5] 12 months, DH<DD, HH; 18 months, DH<HH

As Table 3.5 shows, group DH Child Behavior dimension ratings tended to be lower than those for DD and HH children. However, a MANOVA with child ratings as dependent variables failed to indicate any statistically significant effects for group, for age, or for group by age.

Analysis of the Dyadic dimension ratings indicated significant effects for group only, $F(2,40) = 6.64$, $p = .003$. As Table 3.6 shows, the groups differed on all three subscales, with follow-up tests identifying differences at 12 months on Enjoyment, and at 12 and 18 months on Understanding and Turntaking. In each comparison, group DH scored lower than either other group, while groups HH and DD did not differ.

A final MANOVA employed as dependent variables the Summary Scores for each dimension: mothers' behavior, children's behavior, dyadic behavior. (Summary scores are given in Tables above for each dimension.) A significant effect for hearing status group was indicated, $F(2,40) = 5.90$ $p = .006$. Follow-up tests revealed that DH mothers' summary scores were lower than those of group DD and HH mothers at 12 months. At 18 months, group DH mothers' scores were significantly lower than those of group HH mothers. Group DH dyadic scores were significantly below those for the other two groups at both 12 and 18 months. As before, there were no differences between groups DD and HH. Children's summary scores did not differ significantly.

Table 3.5

Group Means and Standard Deviations on Ratings of Childrens' Behaviors[1]

Variable	12 months			18 months		
	D/D	D/H	H/H	D/D	D/H	H/H
	M	M	M	M	M	M
	(SD)	(SD)	(SD)	(SD)	(SD)	(SD)
Compliance	3.4	2.8	3.4	3.5	3.0	3.8
	(1.1)	(1.2)	(1.2	(1.0)	(1.2)	(1.0)
Affect	3.5	2.7	3.2	3.5	2.6	3.4
	(.9)	(1.0)	(1.2)	(.9)	(1.3)	(1.3)
Involvement	4.1	3.3	4.0	3.7	3.6	3.9
	(.8)	(1.1)	(1.1)	(.9)	(1.1)	(1.4)
Gentleness	3.7	3.3	3.9	3.3	3.1	4.0
	(.7)	(.9)	(.7)	(1.0)	(.9)	(1.0)
Summary Score	3.7	3.0	3.7	3.5	3.1	3.8
	(.8)	(.9)	(.9)	(.8)	(1.0)	(1.0)

[1] No statistically significant differences for group, age, or group by age

Table 3.6

Group Means and Standard Deviations on Ratings of Dyadic Interactions[1]

Variable	12 months			18 months			Effects
	D/D	D/H	H/H	D/D	D/H	H/H	Group
	M	M	M	M	M	M	
	(SD)	(SD)	(SD)	(SD)	(SD)	(SD)	
Enjoyment[2]	3.5	2.3	3.6	3.4	2.8	3.7	F= 4.15
	(1.1)	(1.1)	(1.2)	(1.0)	(1.5)	(1.3)	p= .023
Understanding[3]	4.1	2.6	4.0	4.2	2.6	3.9	F= 10.63
	(1.1)	(1.1)	(.9)	(1.1)	(1.3)	(1.3)	p< .0001
Turntaking[4]	3.3	2.3	3.6	3.8	2.6	3.6	F= 5.11
	(1.4)	(1.2)	(1.3)	(1.1)	(1.3)	(1.4)	p= .011
Summary Score[5]	3.6	2.4	3.8	3.7	3.1	4.0	F= 6.64
	(1.1)	(1.0)	(1.1)	(.8)	(1.1)	(1.0)	p= .003

[1] No statistically significant differences by age
[2] 12 months, DH<DD, HH; 18 months, ns
[3] 12 months, DH<DD, HH; 18 months, DH<DD, HH
[4] 12 months, DH<DD, HH; 18 months, DH<DD, HH
[5] 12 months, DH<DD, HH; 18 months, DH<DD, HH

Children's Expressive Language Performance at 18 Months

Although several children in groups DD and HH produced one or more words (spoken or signed) at the 12 month session, such productions were too infrequent for analysis. Analysis of child language, therefore, focused on expressive language produced during the 18-month play session.

Based on the transcripts which had been prepared, one measure of child language represented the frequency of their linguistic productions (signed or spoken utterances) during 10 minutes of the play session. This measure was highly positively associated with the total number of different words or signs the children produced but probably reflects social or interactive style as well as linguistic competence. A oneway analysis of variance for frequency of utterances produced (with square root transformation employed to reduce influence of outliers) showed a significant group difference, $F(2,42) = 5.38$, $p = .008$, with group HH children's frequency of production exceeding that of group DH. Table 3.7 gives group means, medians, ranges, and standard deviations for the untransformed measure.

The children's language performance was then summarized in a second measure that considered structural or syntactic characteristics of the productions as well as semantic diversity and frequency of utterances. Three subgroups were suggested by naturally-occurring breaks in the distribution of expressive language productions. Table 3.8 shows distributions of the children across hearing status groups and the three language level categories.

Children who produced fewer than 3 different words or signs during the session made up the 1st category. This group's frequency of utterance was 3 or less and included 17 children, 9 of them from group DH and the others equally from groups HH and DD.

Children functioning in the middle group produced between 5 and 19 utterances during the session, no more than one of which was longer than one word in length. These children's transcripts included at least 4 different words used in their various utterances. The group was made up of 5 children from each group.

Children in the highest language group produced at least 5 utterances, more than 2 of which were greater than one-word/sign in length or they produced more than 20 utterances with at least one multiword/sign utterance. (Because index-finger points serve as pronouns in American Sign Language [Kantor, 1982], a point produced with a sign was considered to be a two-sign utterance for the children who were using American Sign Language or a signing system.) Of the 13 children in this group, only one was from group DH. The other two groups each had 6 children in the highest group.

A chi-square test ($df = 4$) did not indicate a significant difference in distribution of children in the three language categories by hearing status group. Similarly, gender did not significantly differentiate the children in the three language groups, although somewhat more than half of the highest group was female and the opposite was the case for the two other groups. Relationships between the language measures and other variables are considered below.

Table 3.7

Frequency of Spoken or Signed Linguistic Productions ("Utterances") at 18 Months[1, 2]

	Mean	Median	Range	SD
Deaf children/Deaf mothers	11.8	9.0	0-39	10.7
Deaf children/Hearing mothers	4.6	1.0	0-27	7.4
Hearing children/Hearing mothers	33.1	12.0	0-134	45.6

[1] With square root transformation employed to reduce outliers, $F(2, 42) = 5.38$, $p = .008$, HH > DH.
[2] Table based on untransformed data.

Table 3.8

Distribution of Children by Hearing Status Group and Language Level

Group	Language Level		
	Low	Middle	High
Deaf children/Deaf mothers	4	5	6
Deaf children/Hearing mothers	9	5	1
Hearing children/Hearing mothers	4	5	6

$x^2 = 6.79$ (df = 4), $p = .15$

Relationships between Play, Language, and Interaction Variables

One purpose of this study was to identify relationships between play behaviors and other factors including child hearing status, interaction characteristics, and child language abilities. Two potential outcome measures were considered: time in symbolic play at 18 months; total time in representational play (which includes the symbolic time) at 18 months. After inspection of the data, the latter measure was chosen for analysis because of the relatively large number of children with little time in symbolic-level play and the significant correlation between the two measures ($r=.57$, $p<.0001$, one-tailed).

Regression analyses were planned to include at least one independent variable from the interaction ratings, an earlier measure of play behaviors, and a concurrent measure of expressive language. Correlations between the variables considered for inclusion in the regression analyses are given in table 3.9. All of the measures are inter-correlated, potentially complicating the analysis.

Because of the correlations between variables, a hierarchical multiple regression model was employed, with shared variance assigned to earlier-entered variables. Time in representational play at 18 months was the dependent variable. Independent variables representing developmentally earlier factors were entered before those observed later. In a first equation, hearing status was entered first (with the subjects divided into two groups, deaf and hearing, regardless of mothers' hearing status). This factor accounted for a nonsignificant 3 per cent of variability ($R=.1615$, $F=1.099$, $p=.301$) in the dependent measure. The second variable entered was the summary measure of mothers' interactive characteristics. Mothers' interaction characteristics accounted for a significant additional increment of 14 per cent of the variability in the dependent variable, giving a total $R=.4113$, with a significant change in F ($p=.012$). The measure of total time in representational play at 12 months accounted for an additional, but statistically insignificant, 4 per cent of variability in the dependent variable, bringing the R to .4561. The measure of language level at 18 months (dummy coded to accommodate the three subcategories of performance) was entered last. It accounted for an additional 16 per cent of the variability in representational play at 18 months, producing a final $R=.6077$, with a significant increase in F ($p=.015$). In sum, these variables accounted for 37 per cent of the variability in the outcome measure (with an adjusted R^2 of .28).

Substitutions and additions were then made in the equation to test comparable effects of other selected variables. Gender, even when entered first in the equation, failed to account for a significant proportion of the variability in 18 month play. The measure of dyadic communication (taken from the dyadic scale of the interaction ratings), did not contribute significantly to the prediction when added after the mothers' summary measure, although the mothers' measure continued to contribute significantly if added after the dyadic communication measure. Finally, the language measure of frequency of utterance production was entered in the equation following the language level measure. Frequency of language production did not add significantly to prediction of the outcome variable when entered after language level; however, language level continued to be a significant contributor when entered after the frequency measure. None of the substitutions or additions increased the total amount of variance accounted for in the equation.

Table 3.9

Intercorrelations between Representational Play (18 months) and Other Variables

	P18	P12	MIS	DC	L18	LL186[3]
Representational Play at 18 Months (P18)	x	.3227 (43)[2] P=.07	.4111 (43) P=.003	.4308 (43) P=.002	.3615 (45) P=.007	.5724 (45) "33"
Representational Play at 12 Months (P12)	x	x	.3889 (45) P=.005	.4382 (45) P=.001	.3116 (43) P=.021	.4138 (43) "17"
Mothers' Interaction Summary Score at 12 Months (MIS)	x	x	x	.6913 (45) P<.0001	.2425 (43) P=.059	.3648 (4.. "13"
Dyadic Communication at 12 Months (DC)	x	x	x	x	.3654 (43) P=.008	.5872 (43) "35"
Utterance Frequency at 18 Months (L18)	x	x	x	x	x	.6389 (45) "41"
Language Level at 18 Months (LL18)	x	x	x	x	x	x

[1] Pearson r used for P18-L18
[2] Number of subjects for analysis
[3] Eta coefficient, with LL18 as independent variable; " " = variability in dependent variable accounted for by LL18.

A second analysis was then conducted with time in representational play again serving as dependent variable but with hearing status group (DD, DH, HH, with dummy coding employed) instead of the simple deaf/hearing distinction serving as the independent variable entered first. The group variable accounted for a statistically significant 15 per cent of the variability in 18 month representational play, ($R = .3915$, $F = 3.621$, $p = .036$). When entered after this group variable, mothers' summary interaction score accounted for an additional 7 per cent of variability in the outcome measure ($R = .4762$, significance of F change $= .062$). Time in representational play at 12 months brought the R to .5125, accounting for an additional statistically insignificant 3.5 percent of the variability in the dependent variable. Finally, the language level measure accounted for an additional increment of 13 per cent of the variability ($R = .6209$, significance of F change $= .038$). A total of 39 per cent of the variability (adjusted $R^2 = .28$) in time in representational play at 18 months is accounted for by this set of variables. (See Table 3.10)

Compared with the first equation, the second accounts for the same final amount of variability in time in representational play at 18 months. However, the decrease in variability accounted for by mothers' interaction summary score and by language level when hearing status group (including in its definition the aspect of "match" or "mismatch" in hearing status of child and mother) is entered first is a further indication of the variance shared among these three aspects of the play interaction. Logically, it appears that "group" (indicating combination of mother and infant hearing status) acts as a proxie variable which can masks contributions from the process-oriented variables of mother's behavior and child language performance.

Despite identification of significant contributors to the variance in representational play duration at 18 months, the total variance accounted for was limited to approximately one-third of the total. There are obviously other significant factors affecting the development of play in this sample of children which the current study did not address.

Table 3.10

Predicting Time in Representational Play at 18 Months

from Two Sets of Variables Entered Hierarchically

Equation 1

Step	R	R^2	Adjusted-R^2	F Change/(p)
1. Child Hearing Status (Deaf/Hearing)	.1615	.0261	.0023	1.099/(.301)
2. Mothers' Interaction Summary Score	.4114	.1692	.1277	6.890/(.012)
3. Time, Representational Play, 12 months	.4561	.2080	.1471	1.909/(.175)
4. Language Level, 18 months	.6077	.3693	.2840	4.729/(.015)

Equation 2

Step	R	R^2	Adjusted-R^2	F Change/(p)
1. Mother-Child Hearing Status (DD/DH/HH)	.3915	.1533	.1113	3.621/(.036)
2. Mothers' Interaction Summary Score	.4762	.2267	.1673	3.707/(.062)
3. Time, Representational Play, 12 months	.5125	.2626	.1850	1.847/(.182)
4. Language Level, 18 months	.6209	.3856	.2832	3.601/(.038)

Chapter IV
Discussion

Prior to conducting these analyses, we had hypothesized that all three groups of children would show similar amounts and types of play at 9 and 12 months, with differences occurring at 18 months when expressive language differences became evident. We further hypothesized that child play would be positively associated with characteristics of mother-child interactions and with child language level, and that these relationships would hold across groups.

Our analyses confirmed some but not all aspects of the hypotheses. Based on the number of children in each group who demonstrated specific levels of play at each age as well as comparison across ages of the time in the major play categories, the three groups of children followed the same general progression in development of play behaviors. Most children in each group demonstrated the two earliest levels of play, manipulative and relational, at the 9 month session, with the amount of time spent in relational play increasing rapidly by the 12 month session and time in manipulative play decreasing with age. Representational play was not commonly displayed until the 12 month sessions and time in that category increased significantly by 18 months for all groups. Sequenced play did not emerge until 12 months, when representational play was apparently well established and, like representational play, sequences increased between 12 and 18 months. With only one exception, children did not display symbolic levels of representational play until 18 months. These overall patterns support earlier descriptions of the development of play by hearing infants and toddlers (Belsky & Most, 1981; Bretherton, 1984; Fenson et. al., 1979; McCall, 1974; McCune-Nicolich, 1981).

The play shown by the groups of children in this study differed in one respect from that reported in earlier studies. There was no trend evident in our data for self-oriented representational acts to occur prior to the demonstration of decentered acts. Although it is probable that the long periods of time between our observations resulted in our missing the earliest examples of self-oriented play behaviors, it may also be that such behaviors are preeminent only for a brief period (cf. Belsky & Most, 1981) or that the distinction which is commonly made theoretically is not so evident in children's behavior. Even at the 9 month session, we observed children showing decentered as well as self-oriented play behaviors at the emerging representational level. At 12 months, sequences of decentered actions or with varied participants were more common than sequences of varied self-oriented actions. Furthermore, the first ordered sequence observed in our data involved behaviors directed toward the mother instead of toward the child herself. No consistent group differences were evident in the tendency to produce self-oriented versus decentered behaviors.

Despite the groups' similarities in order of emergence of levels of play, we found group differences as measured both by the number of children in each group demonstrating specific kinds of play at the three ages and by the amount of time spent in various levels of play at the three ages. Although production of the two lower levels of play (manipulative and relational) never differed across groups, more hearing than deaf

children in either group demonstrated representational play at 12 months. Furthermore, hearing children spent more time in representational play at 12 months than did either group of deaf children. This is somewhat puzzling because more deaf than hearing children displayed emerging levels of representation during the 9 month session (although across groups the mean time in representational play did not vary significantly). Therefore, we do not have any evidence that deaf children developed this level of play later than hearing children did--only evidence that its production increased much more rapidly in the hearing group than in either deaf group by the 12 month session.

The picture is further complicated by the fact that the deaf children with Deaf parents matched the hearing children in production of representational play by 18 months. These two groups were also equivalent in their tendency to produce symbolic levels of play at that age. The deaf children with Deaf parents, therefore, showed only a temporary lag in production of representational play at 12 months.

The deaf children with hearing parents showed a different pattern. Although the differences between their time in representational play and that of the other groups was no longer significant at 18 months, the DH children trailed the other groups in the next highest level of play (symbolic) at that age. This group difference appears in nonverbally demonstrated symbolic play (i.e., nonverbally planned play) as well as in symbolic-levels of play which depend by definition on language production (i.e, verbally-announced planned play). The pattern of production of play by children in this study suggests that, beyond the levels of simple manipulative and relational play, DH children's play development in the age span we observed is slower than that of the other groups.

One other interesting group difference was noted in that several children from each deaf group but none of the hearing children produced complex relational (constructional) play. This corresponds with an earlier report (Higginbotham & Baker, 1981) of increased frequency of constructional play by deaf children. In the current study, such play was relatively infrequent for any of the groups of children. However, the possibility of differences in predominant play style along the "patterner-dramatist" continuum (Wolf & Gardner, 1978) between deaf and hearing children merits further investigation.

For potential explanations of the group differences noted above in production of representational and symbolic play, we look to other aspects of the children's developing skills and their history of interactive experiences. Results of the ratings of dyadic interaction and mothers' and children's behaviors during those interactions are consistent with earlier reports (e.g. Schlesinger & Meadow, 1972). Overall, the interactions between deaf children and hearing mothers appeared to be less cohesive and mutually reinforcing than interactions between the other two groups of dyads. This finding is important for at least two reasons. First, it indicates that even with early identification of hearing loss and provision of intervention services, a substantial proportion of the DH group continues to face difficulties during early interactions.[5] These difficulties can be

expected to have negative effects on the later development of the children and on the families' adjustment to the child's hearing loss. Second, more directly related to our current discussion of children's play skills, it suggests that hearing mothers may be generally less successful at facilitating and encouraging their children's play during interactions with toys.

It is important to remember that we observed child play during interaction with mother. Although MacDonald (1993) defends this approach because mother-child dyadic play seems to be especially strongly related to children's later functioning, findings of other researchers (Fiese, 1990; Vibbert & Bornstein, 1989) that mothers are not equally successful at facilitating child play must be considered in interpreting our results. The mere presence of mother does not seem to enhance child play beyond that which he or she would show when playing alone (O'Connell & Bretheron, 1984). However, some mothers, or specific behaviors produced by mothers, are able to boost the children's performance above that which they would show alone (Slade, 1987).

Let us assume for a moment that all of the children in the current study were capable of higher-level symbolic play with assistance (i.e., in the "proximal zone of development" as defined by Vygotsky, 1978), but only a subset of the children functioned at this level most of the time. The more highly developed subset of children would probably give evidence of higher levels of play even during a brief observation if appropriate toys and context are available. The rest of the group, however, might show the higher level behavior if appropriate encouragement is provided by the play partner but not if such encouragement is not provided. Given that we found group differences in the quality of maternal interactive behaviors, it is not unrealistic to suspect that some mothers were better able to prompt their children's highest (or emerging) level of play than were others. Therefore, our findings of child differences by group in the production of play may be confounded with differences in their mothers' skills, or perhaps even their mothers' interest in facilitating higher levels of play. The association between mothers' interactive behaviors and child play behaviors existed even after accounting for effects of hearing status group.

Ratings of maternal interactive behaviors do not provide us with any insight into the temporary lag in representational play observed for the deaf children with Deaf mothers at 12 months. Interactive ratings for these dyads never differed significantly from those of the hearing-hearing dyads. It is important to note, however, that the interactive ratings were ratings of quality of interactive behaviors, not of quantity. In light of reports that specific maternal behaviors influence child play, the pattern of differences between groups DD and HH could be explained if the frequency with which DD mothers encouraged specific play behaviors was lower than that for the hearing group at 12 months, and if frequencies of encouragement either increased or were less necessary to support higher-level play at 18 months.

In fact, an auxiliary analysis in progress on these same videotapes of free play (Koester & Spencer, 1993) indicates that Deaf mothers produce many fewer communications during the 12 month interactions with their deaf children than hearing mothers do. The

Deaf mothers' lower rate of communication may stem from their being sensitive to their infants' direction of gaze. That is, these mothers recognize the child's difficulty in receiving visually-transmitted communications while also visually exploring or engaging with objects. Employing strategies for communicative turntaking different from those required for communicative exchanges with hearing children, Deaf mothers have been noted to wait often either for the children to look at them or use tapping on the child to direct attention to themselves before signing messages to the child (Erting et. al., 1990; Spencer, Gutfreund, & Bodner-Johnson, 1992; Waxman, Spencer, & Poisson, 1993). Differences between Deaf and hearing mothers in the rate of maternal communications at 12 months could also reflect differences between the mothers' beliefs about appropriate behaviors during the free play situation at that age. Several Deaf mothers expressed to us their interest in having their children develop "independence," and such a pattern might reflect this desire. Regardless of its origin, this pattern of decreased maternal communication at 12 months may result in the DD children actually receiving fewer suggestions and prompts for play at that age than hearing children do and, therefore, for the deaf children's play to more closely reflect the child's typical rather than maternally-enhanced level of play.

The relationship between quantity of maternal behaviors and child play posited above has not yet been tested specifically and is, therefore, speculative. It is interesting, however, to note that at 18 months, when children are more adept at coordinating visual attention to persons and objects sequentially, Deaf mothers increased their rate of communications during free play with their deaf children (Koester & Spencer, 1993), and the play of deaf children with Deaf mothers was equivalent to that of the hearing children.

It is also important to note that the amount of higher level play at 12 months was not associated with time in higher level play at 18 months after group hearing status and ratings of mothers' interactive behaviors had been controlled. In fact, when Group DD was considered separately their time in representational play at 12 and at 18 months were not related. Thus, it would be wrong to predict 18-month play behaviors for this group based on their 12-month performance. Their pattern of development of representational and symbolic play, although different from that of hearing children, probably reflects adaptive accommodation to deafness and to visual communication.

In addition to being associated with characteristics of interactions experienced by the children, children's 18-month play performance was significantly related to the concurrent level of child expressive language. This is consistent with findings from earlier studies of deaf children (Casby & McCormack, 1981; Vygotsky, 1978), although some studies of play behaviors of hearing children have found relationships between play and receptive but not expressive language (Sigman & Sena, 1993). We do not yet have sufficient data on language development of deaf children to know whether their receptive and expressive language skills are related in the same way as for hearing children. It is probable, however, that inconsistencies across studies of hearing children as well as discrepancies between studies of deaf and of hearing children result from the differing relationship between receptive and expressive language over the developmental course

(Bates, et al, 1984). Because we do not have receptive language measures for the children in our study, we cannot know whether receptive language would have been more or less closely associated with the children's play skills than is their expressive language.

The relationship we found between expressive language and children's play does, however, lend weight to concerns about the use of play to assess either cognitive achievement or linguistic "readiness" of children whose language is delayed for age. Children in groups DD or HH, who were acquiring language through exposure to "expert" models presented in a modality they could easily receive and process may have shown a close association between language and play levels because of endogenous factors. That is, natural distribution of abilities in cognitive-symbolization or socialization may have similarly affected both play and language for these groups. This cannot be said for the group of deaf children with hearing parents who were either being exposed to language in a modality which was not fully functional for them or whose "expert" language modelers were not fluent in the use of the language themselves. The greater incidence of delayed language in this group of children is thus more readily explained by exogenous rather than endogenous causes and, unless use of language in some way influences the level of play demonstrated, a systematic relationship between play and language should not be evident in this group. However, such a relationship exists. This leads us to conclude that the ability to use language does have an effect on play abilities which typically develop during the second year of life. Accordingly, using observations of play behaviors to assess underlying cognitive-symbolic abilities or "readiness for language" of children with language delays is problematic and there is risk for negative bias in such assessments.

This is not to indicate, however, that such assessments do not provide useful information. Observations of dyadic play can provide interventionists with important insights into the child's typical level of symbolic activity as well as interest in and ability to communicate with others. Similarly, mothers' ability to provide effective support for child play and communication can be observed during dyadic play. Dyadic play with toys can also provide insights into the degree to which mothers are able to accommodate their signing deaf children's need to divide visual attention between the social and the object world. Concomitantly, dyadic play observations provide information about the child's current ability to coordinate attention to persons and to objects. All of this information can help to establish program goals and develop intervention strategies for individual children.

Finally, it is important to consider the fact that only about one-third of the variability in child play at 18 months was accounted for by the three variables (dyadic and individual hearing status, interaction characteristics, expressive language development) employed in this study. The influence of additional factors (including but not limited to children's patterns of attending to others, children's receptive language, specific strategies used by adults to prompt or facilitate play, and other aspects of child cognitive development) needs to be explored to increase our understanding of the process through which deaf children develop and display symbolic skills through their play.

Chapter V
Conclusions and Recommendations

Findings of this study of deaf and hearing children at 9, 12, and 18 months indicated that, while all of the children seemed to develop play behaviors in the general order posited in earlier work, the rate at which those behaviors were developed and displayed in dyadic play differed according to the hearing status of child and mother. Although production of manipulative and relational play was strikingly similar across the groups, hearing children displayed more representational play at 12 months than did either group of deaf children, and deaf as well as hearing children whose mothers' hearing status matched their own produced more symbolic play at 18 months than did deaf children whose mothers were hearing. A significant portion of individual differences in 18-month production of representational and symbolic play was explained by characteristics of mothers' behaviors during earlier interactions with the child. Child level of expressive language was concurrently associated with the amount of higher level play that was demonstrated at 18 months.

We conclude that child play demonstrated during interaction with mother reflects influences from the social environment as well as influences from child cognitive-symbolic abilities. Therefore, we believe that the mother-child dyadic play of children who experience either language delays or whose interactive experiences differ from those of normally-developing hearing children will differ accordingly from standards set through observation of the latter group of children.

Based upon our interpretation of findings from this study, we recommend the following:

1. Because the pattern and rate of development of play differed across the three groups of children in this study, observations and assessments of deaf children's play (in mother-child free play) during the ages of approximately one to one- and one-half years of age should not be used to predict future developmental trends or to infer capacity or "readiness" for developmental steps.

2. Due to maternal influences on child play displayed during dyadic interaction, attempts to tap a child's highest level of play abilities should combine elicited play formats with observations of dyadic (social) play.

3. More research is needed on potential differences in play styles of deaf and hearing children and on specific strategies which adults can employ to prompt higher levels of play by deaf children.

4. Study of deaf children's development of play across a longer age range is needed to investigate further the meaning of patterns which are seen in early play behaviors. This information is needed before play assessments are used for predictions of development rather than as descriptions of current functioning.

5. Similar studies of the play of hearing children with specific language delay should be undertaken, with effects of maternal behaviors and child language abilities covaried, to determine whether the pattern reported in this study is typical of children with language delays not specific to hearing loss.

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Footnotes

1 Authors have differed in use of the tems "representational play" and "symbolic play." Some (e.g. McCune-Nicolich, 1981) have referred to both levels, representational use of realistic objects and abstract behaviors including object substitution and verbal planning as "symbolic." Others (e.g., Ungerer & Sigman, 1984) reserved the term "symbolic" for the higher-level behaviors only. We follow the latter model in the current paper.

2 Mothers referred to as "Deaf" in this study consider themselves to be members of the Deaf Community.

3 Assistance in subject recruitment and data collection from both groups of children with hearing mothers was provided by: Dr. Lauren Adamson, Dr. Roger Bakeman, and Diane Slocumb (Georgia State University); Dr. Jeffrey Cohn, Sally Popper and Shelly Ross (University of Pittsburgh); Dr. Amy Lederberg, Vicki Everhart and Karen Laljiani (University of Texas, Dallas), Dr. Edward Tronick and Karen Nelson (University of Massachusetts, Amherst, and Boston Children's Hospital).

4 Annie G. Steinberg, M. D., is a pediatrician and child psychiatrist; Carol J. Erting, Ph.D., is an anthropologist; Carren J. Stika, Ph.D., is a clinical psychologist. All four raters have extensive experience with deaf children and their families and are familiar with sign language.

5 However, an earlier analysis of two of the three groups of infants (DH and HH) at 18 months showed that the mothers with deaf infants received lower ratings for interaction only if they reported low levels of social support (Meadow & Steinberg, 1993).

Appendix A, Part .1
System of Codes for Play Behaviors[1]

One and only one of the following codes is assigned to each discrete behavior produced.

Code		
	I.	**Manipulative Play - Attending to single object**
01		A. Mouths object for at least 2 seconds
02		B. Simple Manipulation-Visually attends to object while grasping, touching, examining or carrying object; must last at least 2 seconds.
03		C. Differentiated Manipulation - Produces behavior appropriate for exploring physical characteristics of object; includes crumpling, shaking, poking, stroking, throwing, pushing objects.
04		D. Complex Manipulation - Performs activity appropriate for a specific object or for part-whole relationships; includes putting body part in container (e.g., puts bucket on head), pushing a button or turning a knob, spinning wheels on toy car, emptying bucket to see contents, ripping or pulling apart object, turning dial on phone (without evidence of pretend), squeezing sponge.
	II.	**Relational Play - Attending to more than one object**
11		A. Simple Relational - Simultaneous actions with more than one object, but actions are not appropriate to functions for which objects were designed; includes hitting objects together, setting doll on phone.
12		B. Functional Relational - Simultaneous actions with two or more objects in a manner related to their visual or physical characteristics; includes setting cup on saucer (without evidence of pretend) putting objects into and out of container, removing and replacing lid on bucket, connecting pop beads, stacking plates.

NOTE: picking objects out of container without putting them back is coded Simple Manipulation; taking lid off of bucket without trying to put it back on is coded Simple Manipulation. Functional Relational is only coded if child is clearly aware of the relationship between the objects. If child performs a series of actions taking objects out of bucket and at any time during that series of behaviors puts something in bucket, code every action in the series as Functional Relational.

Similarly, if child only pulls apart or breaks a pop bead string, code Complex Manipulation; however, if the child attempts to reconnect the beads during the series of actions, code each action as Functional Relational.

13 C. Complex (Constructional) Relational - Simultaneous or Sequential Actions with two or more objects in a complex relationship which is based primarily on spatial-perceptual characteristics of objects; includes building tower with blocks, arranging blocks carefully in cart.

III. Representational Play

20 A. Inaccurate Representation - Child produces functional behavior with object but appears to have misinterpreted the object. Evidence of substitutional play is not available. Example: picks up spoon and combs hair with it.

21 B. Emerging Self-Oriented Representation - This includes the categories of "Enactive Naming" in which child briefly demonstrates object function (e.g., touches mouth with toy bottle) without giving clear evidence of pretending, and self-oriented actions with objects that are not performed accurately (e.g., picks up comb, holds it with teeth pointing away from head, then rubs it across forehead and across back of head).

25 C. Emerging Decentered Representation - Produces action directed toward mother, doll, or stuffed toy but action is very brief (with no clear evidence of pretend) or produces action typically performed by other (again, briefly, inaccurately, with no clear evidence of pretend). Examples: rubs back side of brush (without bristles) across mother's head; hugs doll without further evidence of pretend; holds non-nipple end of toy bottle to doll's mouth.

22 D. Established Self-Oriented Representation - Performs activity like those he/she performs in real life which involve own body and typical behaviors. Gives evidence of pretend by smiling, accompanying behavior by appropriate vocalizations or facial expressions, or being careful to set up and perform activity correctly. Example: pretends to drink from toy bottle by orienting bottle correctly and raising chin, tilting head back; lifts empty spoon to mouth, makes biting or chewing motions or signs "good."

23 E. Established Decentered Representation - Involves other actors or recipients (mother, doll, stuffed toy) in play or performs activity typically performed in real life by other person, not child. Gives

evidence of pretend. Examples: "feeds' bottle to mother; orients brush correctly and brushes doll's hair several strokes; rubs sponge on dish to "wash" it; "pours" carefully from teapot into small cup; holds phone receiver to ear and says or signs "Hello."

**When appropriate, the following codes are assigned to Representational Level play behaviors:

IV. Sequenced Representational Play - Series of related representations uninterrupted by lower levels of play or extended redirection of attention.

40 . Same Action, different locations - Examples: hammers on bucket, then on cart; "washes" plate then cup with sponge.

NOTE: Same actions repeated in same locations and with no change in participant are treated as separate, non-sequenced behaviors (i.e., hammers on bucket, pauses, hammers on bucket again.)

41 Same Action, different participants - Examples: child drinks from toy bottle, then "feeds" doll with bottle; child combs own hair, then mother's hair.

42 Different Actions, self-oriented - Examples: Brings toy bottle to mouth as though drinking, then "spoons food" to mouth from bowl.

45 Different Actions, decentered - Examples: Hugs doll, lays it down as though sleeping, begins to "feed" doll with spoon.

50 Book Sequence (Book available at 18 months only) - Pretends to "read" book by turning pages, pointing to or labelling pictures.

V. Symbolic Play - These representational-level activities give evidence of mental symbolic manipulations

43 Ordered Self-Oriented Sequence - Two or more self-oriented representational behaviors in logical ("real-life") or canonical order. Example: Pour from pitcher to cup, drink from cup; stir spoon in bowl, eat from spoon. (Refer to list from Fenson & Ramsay, 1980, in McCune-Nicolich, 1983)

46 Ordered Decentered Sequence - Two or more representational behaviors, at least one of which is decentered, produced in logical ("real-life"), canonical order. Examples: Pour from pitcher to cup, feed "liquid" from cup to mother, doll, or stuffed animal; put doll in bed, cover with blanket;

sit doll on chair, feed doll with spoon, wipe doll's face. (Refer to list from Fenson & Ramsay, 1980, in McCune-Nicolich, 1983.)

51 Nonverbally planned play - representational act preceded by clear preparatory behavior, including search for specific object or production of an intervening act necessary to "set up" the play. Examples: Picks up cup, searches through toy box, discarding toys until pitcher is found, orients pitcher correctly and "pours" into cup; works diligently to straighten legs of man doll, then makes doll "dance."

52 Verbally - announced planned play. As above, except verbal production gives additional evidence of planning. Example: Walks to Mom, holding out cup, says "coffee?", hands cup to mom; picks up toy bottle, signs "Baby," looks around to find doll, then "feeds" it.

61 Nonverbal substitution - to be credited without verbal announcement, child must (1) show through laughter or facial expression that this use of object is a "joke" or (2) produce more than one action with the substitute object. Examples: Child has been brushing own hair with hairbrush, then stops, laughs, and uses hairbrush as a toothbrush; child uses tongue depressor like a knife to "cut" beads apart, then turns and "cuts" babydoll's dress.

62 Verbally Announced substitution - Examples: Child puts seashell on doll's head, saying "hat"; child holds block to own ear, tilts head and says "hello."

72 Attributional - child attributes feelings or actions to an inanimate object (i.e., doll, stuffed animal) or pretends to be experiencing something which is not happening. Example: Child drops doll, looks at it and signs to mother, "Baby cry;"child walks around room, holds doll, says to mother, "Baby hungry;" child pretends to drink from cup, signs "Yummy."

*****

00 No object-related play - include periods of disengagement, locomotion, social interactions without object focus.

[1] Code categories depend heavily on systems developed by Belsky & Most (1981), McCune-Nicolich (1983), Fein (1973, cited in McCune-Nicolich), and Fenson & Ramsay, (1980, cited in McCune-Nicolich).

Appendix A, Part 2
Rules for Timing Onset and Termination of Episodes

All sessions:

- Episodes may consist of a single behavior with an object.
- Episode begins when child touches an object and continues through subsequent actions with that object or a group of related objects.
- Episode ends when child drops object or when his attention is clearly directed toward another object or activity (even if he continues to hold original object in hand).
- If child is off camera or otherwise not visible for 3 seconds, code "off camera" and add that amount of time to the original ending time. (All children must be coded for 10 minutes of visible time.)
- Codes 00 (no object play), 01, 02 must last at least 2 seconds to be coded. Other behaviors are coded regardless of duration but are to be assigned at least 1 second of time.

12 & 18 months:

- Manipulative behaviors must be at least two seconds in duration and do not need to be broken down into 01, 02, etc. Any 01-03 behavior which appears to be a slow beginning or ending of symbolic or representational or relational episode should be included as a part of the higher-level behavior. (04 still coded separately.)
- Once a representational, symbolic or relational episode comprised of > 1 behavior begins, do not break the code for lower level behaviors (or no object) play lasting for up to 10 seconds if the child returns to the original play level or gives evidence that she is continuing to be involved with or attending to the same play as before the interruption. Example: Child feeds bottle to doll, then holds bottle up and looks at mom as she signs about the doll and eating, child picks up spoon and "feeds" doll with it. (Do not code 00 during look to mother.); the child does the lid on/off sequence several times. Then mom tries to start a new activity by trying to interest the child in putting the shapes through the holes on the lid. The child look up at mom for a several seconds but goes back to the lid on/off sequence and ignores her efforts. (The look up at mom would not be coded a 00 in this case.)
- If child does not return to original play theme after interruption, the previous episode is terminated when the interruption began.

Appendix A, Part 3
Data Entry Codes

Columns 1-4 4 digit time code (minutes/seconds)

Columns 6-7 Level of play (00 - 26) as follows:

00 (not engaged with object);

01 (mouthing)

02 (simple manipulation, includes mouthing and differentiated manipulation at ages 12 and 18 months);

03 (differentiated manipulation);

04 (complex manipulation of single object, includes recognition of part-whole relationships);

11 (simple relational play with more than one object, non-functional);

12 (functional relational play with more than one object, including classificatory as well as container-contained relationships);

13 (complex relational play, including building with blocks, arranging objects based on physical, not functional, characteristics);

20 (apparent misidentification of an object leading to it's being used in a way which would be representational if correctly identified...there is a possibility that these are substitutions but there is insufficient evidence to make that judgment);

21 (egocentric recognitory gestures with an object, or representational activity produced inaccurately...object is used to represent an activity typically performed in real life by child...included here is child's holding book and turning pages);

22 (egocentric representational activity showing accurate form/performance...object is used to represent an activity typically performed in real life by child...included here is child's labelling picture in book or acting as though picture is real i.e., patting a picture of a dog);

25 (decentered representational activity produced inaccurately...activity is directed toward another participant [mother or doll] or is one which is not typically performed in real life by child);

23 (decentered representational activity produced accurately...activity is directed toward another participant [mother or doll] or is one which is not typically performed in real life by child);

Columns 12-13 Types of sequences 30-50 as follows:

40 (single action scheme sequence*...representational action is produced with or on more than one object...could be egocentric or decentered...must look to initial code to determine);

41 (simple decentered sequence, in which same representational action is repeated with more than one actor or recipient of the action);

42 (egocentric multi-scheme sequence...varied actions on a theme are produced but these actions include only "21" and "22," that is, activities which the child typically performs in real life and that are oriented toward the child alone);

45 (decentered multi-scheme sequence...varied actions on a theme are produced including either/or actions which are coded "25" or "23" and thus are typically performed by persons other than the child--or actions directed toward mother or dolls);

50 (book sequence...these include any sustained episode in which child holds book, turns pages, or labels by word or action a picture or activity in the book...can identify those with labelling or true symbolic behavior by presence of "22" or "23" in code list).

*If the same action is repeated with the same object, it is not considered to be a sequence, regardless of duration or frequency of repetition.

Columns 15-16 (Initiator of play activity)

33 (initiated by child...this includes instances in which mother helps child perform activity as long as doing the activity was the child's idea)

34 (activity is accomplished only through mother's molding/moving child through activity; this time is to be counted as "00" in initial analyses.)

(All of the following codes indicate behaviors which are "ABSTRACT" thus are considered to be fully symbolic. In each case, the child goes beyond behavior prompted by the "index" of the object itself and brings mental, symbolic activity to the fore...either in recreating realistic sequences, using pre-planning of activities, making object substitutions, acting "for" a doll or other object, or pretending beyond the physically available perceptual input.)

Columns 18-19 (Logical Sequences or "Scripted" Sequences)

43 (Behavior marked is one of an ordered or scripted sequence in which events are performed in a standardly occurring order; all activities in this sequence are at the 21/22 level, that is, they are egocentric activities which child directs toward self and/or represent activities the child is expected to perform frequently in real life);

44 (Denotes the final behavior in a sequence of 43 activities);

46 (Behavior marked is one of an ordered or scripted sequence in which events are performed in a standardly-occurring order; at least one activity in this sequence is "decentered," that is, is at the 25/23 level or is directed toward mother or doll);

47 (Denotes the final behavior in a sequence of 46 activities).

Columns 21-22 (Pre-planned behaviors)

51 (Non-verbal evidence of preplanning is shown, usually by a directed search for "just the right object" before beginning the activity or by taking care to arrange/set up appropriately for the activity.)

52 (Verbal announcement is given of the pre-planned activity)*
*If both non-verbal and verbal evidence is shown, only "verbal" is coded.

Columns 24-25 (Substitution/pretending beyond immediate context)

35 (Mother sets up an object substitution situation and child goes along with it, apparently aware of the act of substitution. This is coded for the first act after mother's initiation. Subsequent similar behaviors produced on the child's initiative, even if using the same object, are coded as 61 or 62 depending on the presence or absence of verbal announcement by the child.)

61 (Non-verbal evidence is given of object substitution; This requires that the child laugh or give other evidence of recognition that the situation is different.from expected or that the behavior be repeated with variation in context using the same or a series of object substitutions.)

62 (Verbal announcement of the substitution is given by the child; if both non-verbal and verbal evidence are produced, only "verbal" is coded.)

72 (This code is used for a variety of abstract-level acts by the child in which feelings, actions are attributed to an object [usually a doll] or the child pretends [always verbally] to be experiencing something which is not really happening. This includes "talking for" a doll, interpreting a doll's feelings ["She's hungry; {She} cry], talking "to" a doll, saying/signing "yum" after pretending to eat or drink.)

71 (This code was set aside to indicate instances in which child assigned a "role" to self or other ["You be the mommy"]. No instances of this behavior were observed.)

Appendix B
Dimensions and Definitions
Global Rating Scale
Mother-Infant Interaction

Mother:

1. Provides many visual cues (based on first 5 minutes only).

   High rating: Mother positions self or child for maximum visibility. She makes frequent use of body movement, gesture and facial expression. She speaks when child is attending to her face, waits to demonstrate object until child can see what is happening.

   Low rating: Mother consistently places self behind child, speaks or gestures when child is attending elsewhere. Uses very little gesture or body language. Face characterized by immobility of feature, facial expression primarily neutral. Communication primarily verbal, little or no physical or object demonstration.

2. Affective tone: facial expression (based on first 5 minutes only).

   High rating: Frequent smiling, pleasant, "approving" expression is characteristic. No frowning.

   Low rating: Doesn't often smile. Face in repose not positive. Frowns, stern expression, unapproving.

3. Affective tone: vocal expression (based on minute 6 through minute 8). (This dimension was not used in the final analysis as inter-rater reliability was not sufficiently high.)

4. Use of touch.

   High rating: Touch both frequent and positive. Include body contact such as cuddling, with child sitting on mom's lap.

   Low rating: Very little touching OR any negative use of touch.

5. Sensitive vs. intrusive.

   High rating: Mother responds to child's interest, willing to continue activity initiated by child. Gives child time to absorb one offered object/activity before beginning another. Provides appropriate structure and opportunity for child to pursue a variety of toys. Selects objects that stimulate child. Does not interrupt a child-initiated activity with another. Appears to "play" rather than "teach." Pacing seems appropriate for child's age and situation.

   Low rating: Mother constantly intervenes or intrudes on child's attention or self-initiated exploration or activity. Doesn't wait for a lull to introduce a new object. Insensitive to child's interest; may appear anxious or frantic in introduction of new activity. Teaches or instructs rather than plays.

6. Participatory, involved vs. passive, disengaged.

   High rating: Mother expresses interest in play activities. Responds with pleasure to child's overtures or initiates playful activities of her own design.

   Low rating: Seems passive, lacking interest. May appear to define situation as one in which the child plays and she watches without participating.

7. Flexible, creative vs. rigid, unimaginative.

   High rating: The flexible mother may set rules for safety, behavior, but is willing to bend them at times. She is willing to accept a child's expression of disinterest in her proposed activity. She has imagination in getting child to follow the rules in getting him/her to perform a task. Creativity may also be evidenced in use of materials and play.

   Low rating: The rigid mother is unwilling to change a routine that has begun, is strict in the letter of the rule she has made, does not cajole or try to re-direct child's attention from a forbidden behavior. She may also lack imagination in use of materials, in capturing child's attention, or finding interesting play.

8. Overall affective tone.

   High rating: Facial, vocal, body language, tactile for entire viewing time is positive, warm, smiling, pleasant.

   Low rating: Negative, lacking in warmth

9. Consistent vs. inconsistent.

   High rating: Affect (positive or negative), flexibility/rigidity, responsiveness/non-responsiveness not subject to quick changes. Mother's behavior is consistent throughout the entire period of play.

   Low rating: Changes frequently/abruptly from positive to negative, permissive to strict, smiling to frowning. Neither behavior nor affect is predictable or "the words are right but the music wrong."

Child:

1. Attentive to visual cues (based on first 5 minutes only).

   High rating: Watches mother's facial/hand/body movements from beginning to end. Gazes from mother to object if mother is demonstrating. Concentration more apparent when mother is communicating physically (by body movement, gesture, facial expression, object movement.)

   Low rating: Child rarely looks at mother. Gaze focused on room, toys, own interest. Seems not to notice mother's efforts to communicate. IF mother fails to use visual cues (including lip movements for speech) for as much as 4 of 5 observed minutes, child will receive a rating of "0" for missing data.

2. Compliant vs. resistant.

   High rating: Child is cooperative, acquiesces to mother's verbal or non-verbal requests/demands, does not disobey or fail to respond to a request for participation in an activity. Compliance is cheerfully, happily given.

Low rating: Child refuses to give in to mother's requests, may respond with defiance or ignore a request. If mother requests and child does not comply, rating should be low whether observer believes that child understood or not. That is, compliance should be rated from the mother's perspective.

3. Overall affective tone.

High rating: Frequent smiling, laughter. Expressions of pleasure in activities. Communicates a sense of happiness.

Low rating: Affect ranges from neutral to sad. Few expressions of pleasure. Absence of spontaneous joy.

4. Participatory, involved vs. passive, disengaged.

High rating: Expresses interest in activities. Responds to mother's overtures and initiates activities reflecting his/her own interest, independence. Not bored.

Low rating: Passive, lacking interest. Content to watch mother or to do nothing. Bored, perhaps tries to leave room. Dependent on mother for activities.

5. Gentle vs. aggressive.

High rating: Child's manner is gentle, "sweet," kind and loving. (May be expressed toward mother and/or toward toys.)

Low rating: May be difficult to control, throws objects, hits mother or doll. Angry, "mean" or hostile quality to behavior.

Dyad:

1. Enjoyment vs. non-enjoyment.

High rating: Both mother and child enjoy the activities/interaction. Neither is bored, take pleasure in each other's company and the activities each initiates.

Low rating: Little or no pleasure/interest displayed by one or both members of the mother-child pair.

2. Mutual communicative understanding vs. little or no understanding.

   High rating: Both mother and child understand the other's cognitive/linguistic meaning. Shown by behavioral, facial, or gestural/verbal response.

   Low rating: Neither mother nor child understands the other's cognitive/linguistic meaning. Absence of response.

3. Reciprocity of interaction vs. no reciprocity.

   High rating: Dyad engages in turntaking, shared initiations of new activities. May be in verbal communication, in behavioral or object turntaking. Neither has a disproportionate share of initiation.

   Low rating: One or the other member of the pair does most of the initiating of conversation or activity. Or there are a series of monologues with no change of speaker/initiator.